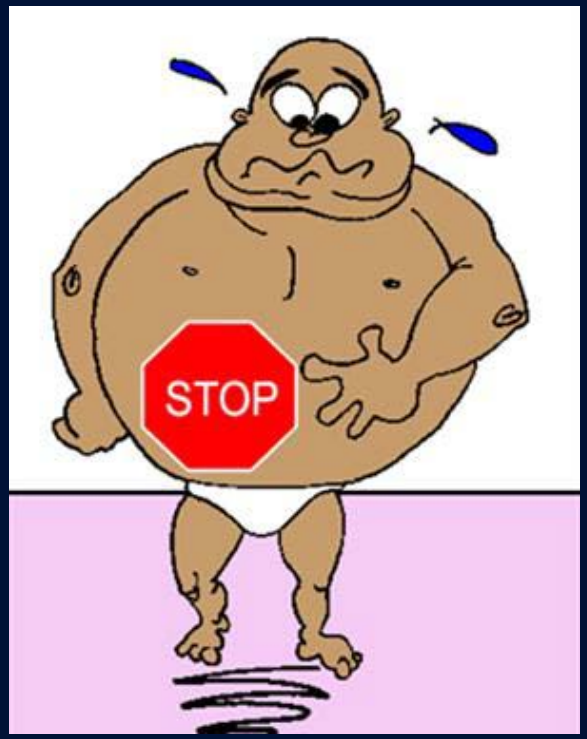
Intestinal obstruction

Catedra de Chirurgie nr.1 „Nicolae Anestiadi”

Intestinal obstruction is a partial or complete blockage of the bowel that results in the failure of the intestinal contents to pass through.

Alternative names: Intestinal volvulus; Bowel obstruction; Ileus; Colonic ileus.



It can occur at any level from the distal duodenum to the small intestine or colon and represents a medical (surgical) emergency.

Intestinal obstruction accounts 3.5-9% from all the patients admitted to the ER.

Obstruction of the bowel may be induced by:

1. **A mechanical cause, which simply means something is in the way.**
2. **A condition in which the bowel doesn't work correctly but there is no structural problem (Ileus).**

The most common causes of mechanical obstruction are:

adhesions, hernias, and tumors.

Other general causes are:

foreign bodies (including gallstones), volvulus (twisting of bowel on its mesentery), diverticulitis, intussusception (telescoping of one segment of bowel into another) and fecal impaction.

Congenital: Atresia is the most common cause of congenital intestinal obstruction and accounts for about one third of all cases of intestinal obstruction in the newborn.

Acquired: Mechanical or dynamic intestinal obstruction.

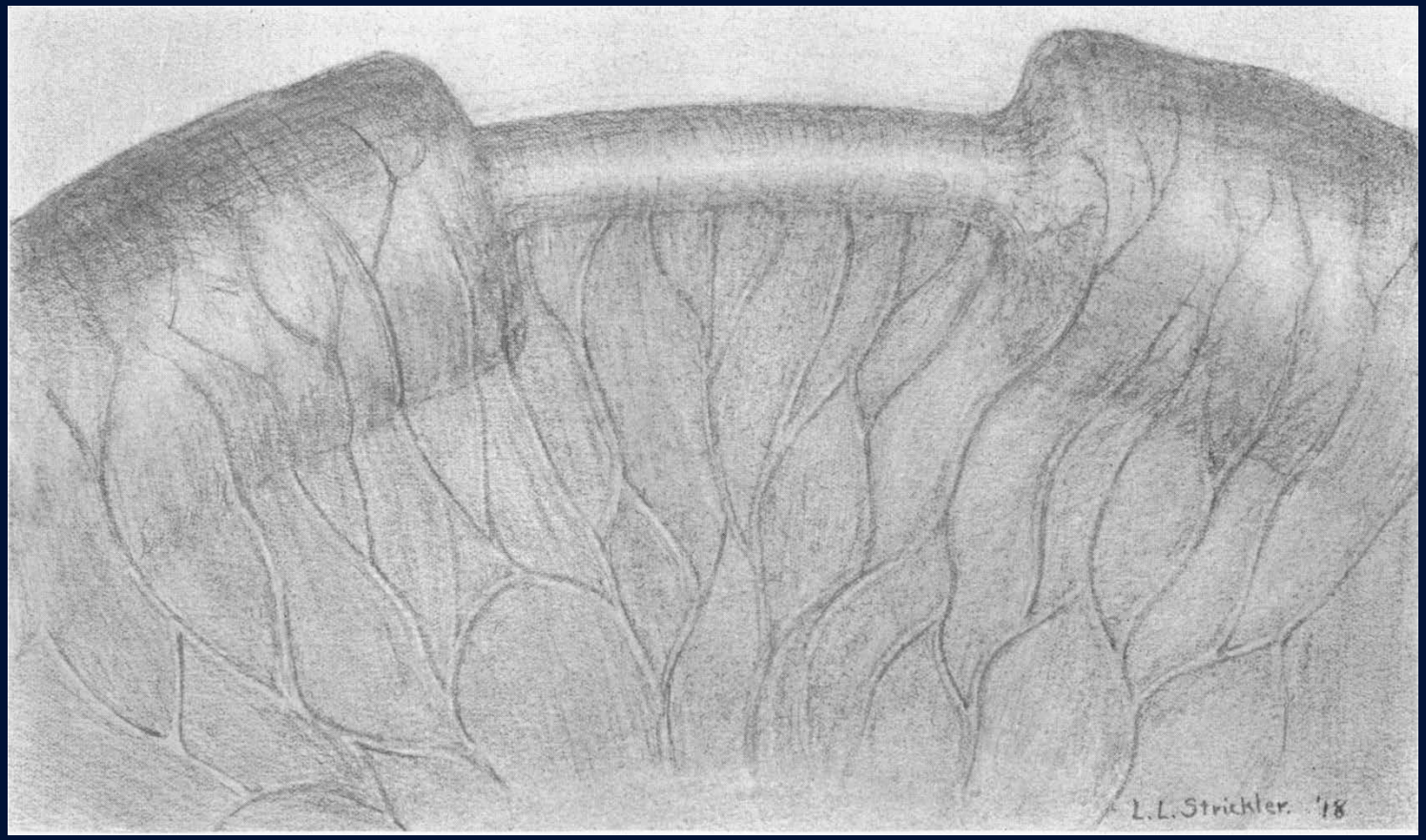
Proximal intestinal obstruction: (small bowel).

Distal intestinal obstruction: (colon).

Mechanical obstruction: Strangulating (hernia) and simple (intraluminal, intramural, extrinsic and combined).

Dynamic obstruction: Spastic or paralytic.

Spastic ileus: is due to a spasmodic muscular contraction of a portion of the intestinal tract. It may affect either the small or the large bowel or both; in one place usually, or possibly in many places. A common location is the lower portion of the ileum.



The origin of spastic ileus is involved in considerable obscurity.

There are those who wish to attribute it to local causes-irritation of the peritoneal or mucous surfaces, contusion of the external abdomen (Trendelenburg), or even severe muscular strain.

Others prefer to assume that the sympathetic system or the vagus is the seat of the difficulty, while still others' lay the blame upon the central nervous system alone (hysteria, neurasthenia, tabes dorsalis, etc.).

Payer discards the nervous system altogether, at least in post-operative cases, and insists that the trouble is due to emboli originating in traumatic thrombosis of the omental and mesenteric vessels.

No one of these theories will fit all cases, just as no single explanation will cover all instances of muscular spasm elsewhere.

Paralytic ileus, also called pseudo-obstruction, is one of the major causes of intestinal obstruction in infants and children.

Causes of paralytic ileus may include:

- **Chemical, electrolyte, or mineral disturbances (such as decreased potassium levels);**
- **Complications of intra-abdominal surgery;**
- **Decreased blood supply to the abdominal area (mesenteric artery ischemia);**
- **Injury to the abdominal blood supply;**
- **Intra-abdominal infection;**
- **Kidney or lung disease;**
- **Use of certain medications, especially narcotics;**
- **In older children, paralytic ileus may be due to bacterial, viral, or food poisoning (gastroenteritis), which is sometimes associated with secondary peritonitis and appendicitis.**

Ogilvie syndrome, or acute colonic pseudo-obstruction (ACPO), is a clinical disorder with the signs, symptoms, and radiographic appearance of an acute large bowel obstruction but with no evidence of distal colonic obstruction. The colon may become massively dilated; if not decompressed, the patient risks perforation, peritonitis, and death.

In 1948, Ogilvie described 2 patients with metastatic cancer and retroperitoneal spread to the celiac plexus.

Ogilvie WH. *BMJ*. 1948;2:671-3.

Ogilvie hypothesized that the etiology of their conditions was an imbalance in the autonomic nervous system with sympathetic deprivation to the colon, leading to unopposed parasympathetic tone and regional contraction, with resulting functional obstruction.

In 1958, Dudley et al used the term pseudo-obstruction to describe the clinical appearance of a mechanical obstruction with no evidence of organic disease during laparotomy.

Plane abdominal x-ray – colonic obstruction

Mechanical causes of intestinal obstruction may include:

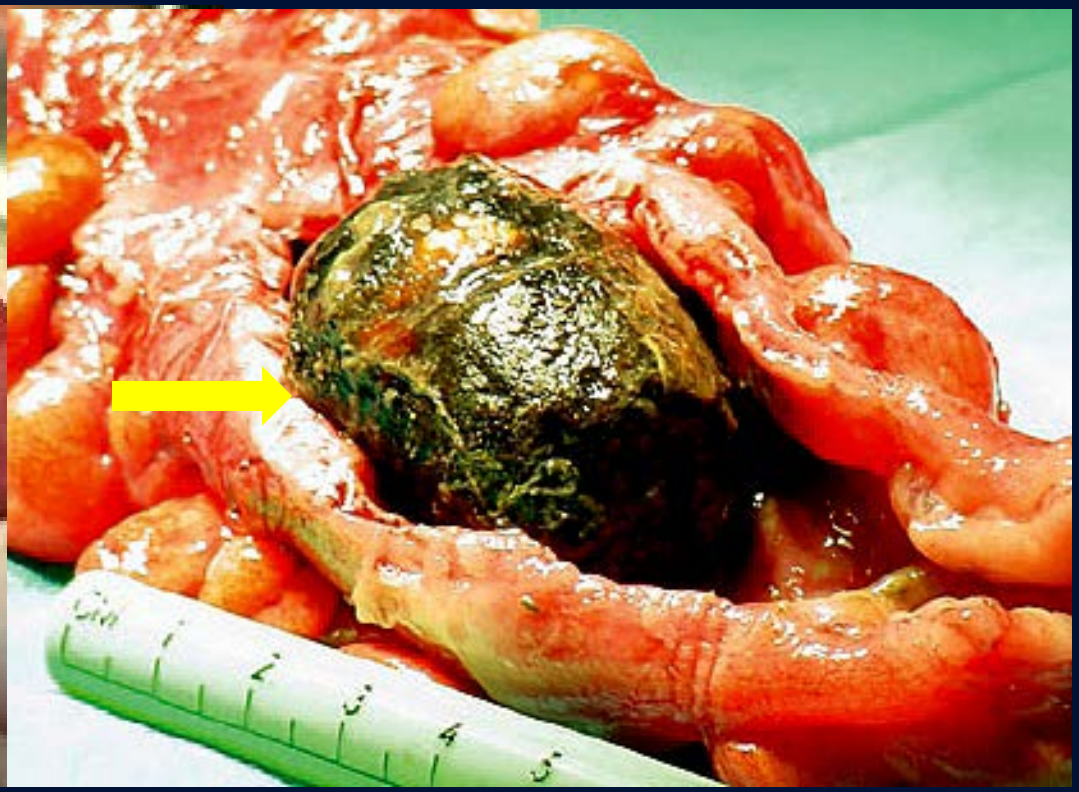
- Abnormal tissue growth
- Adhesions or scar tissue that form after surgery
- Foreign bodies (ingested materials that obstruct the intestines)
- Gallstones
- Hernias
- Impacted feces (stool)
- Intussusception
- Tumors blocking the intestines
- Volvulus (twisted intestine)

• Adhesions - congenital or post-operative	50-70%
• Hernias - internal or external	25%
• Malignancy	5%
• Volvulus - may be around a congenital band adhesion	5%

Mechanical intestinal obstruction:

simple (intraluminal, intramural, extrinsic).

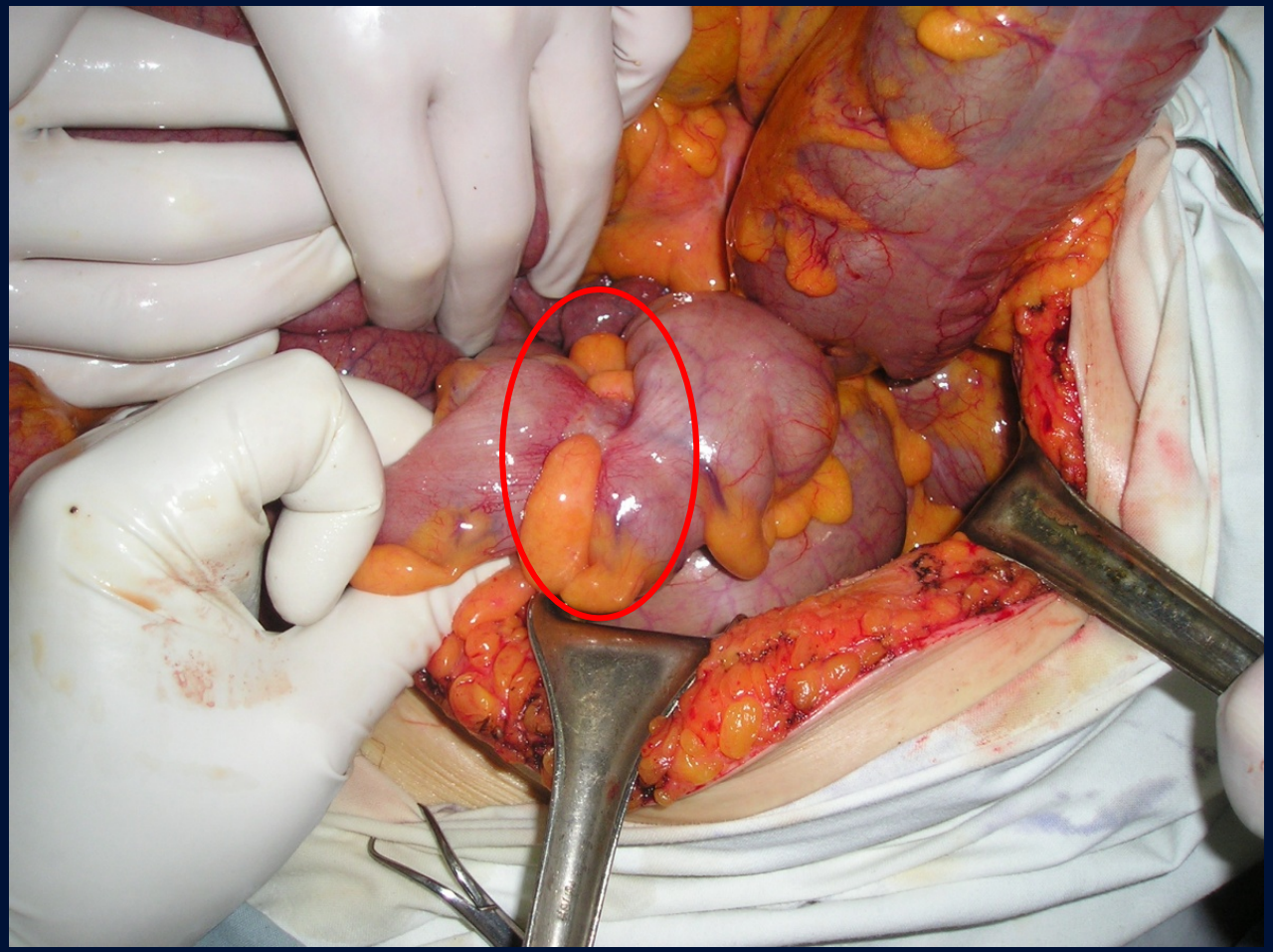
Mechanical intraluminal obstruction (→)
Parasites within the small bowel



Mechanical intraluminal obstruction (→)
Gall stone within the small bowel

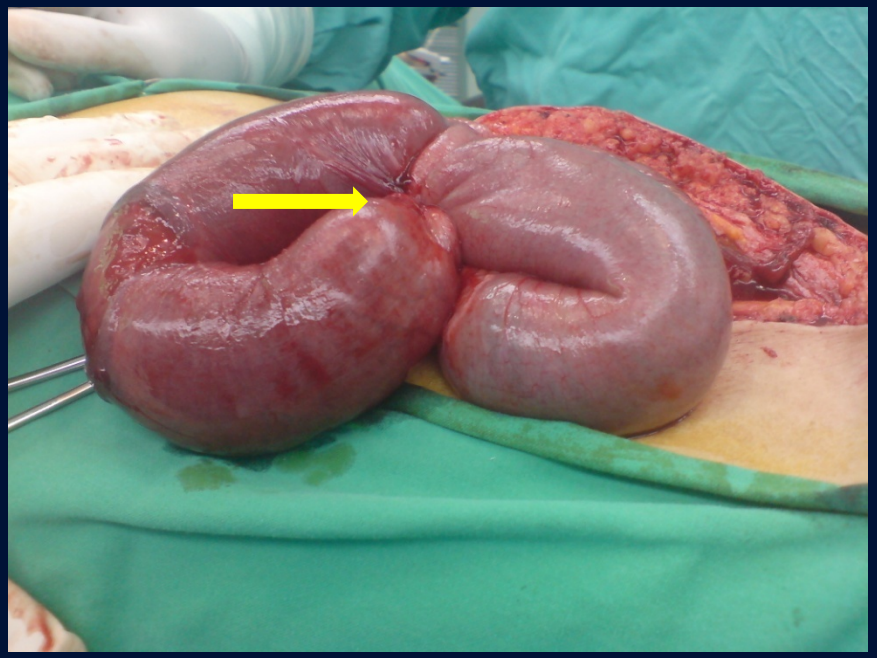
Mechanical intestinal obstruction:

simple (intramural).

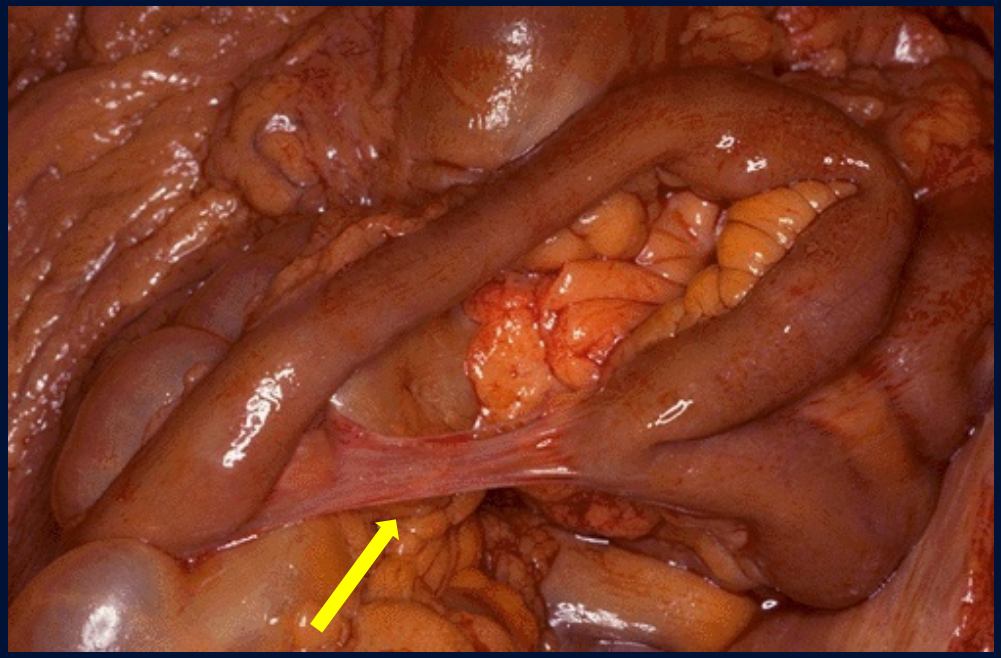


Mechanical intramural obstruction (○)
Obstructive carcinoma of the sigmoid colon

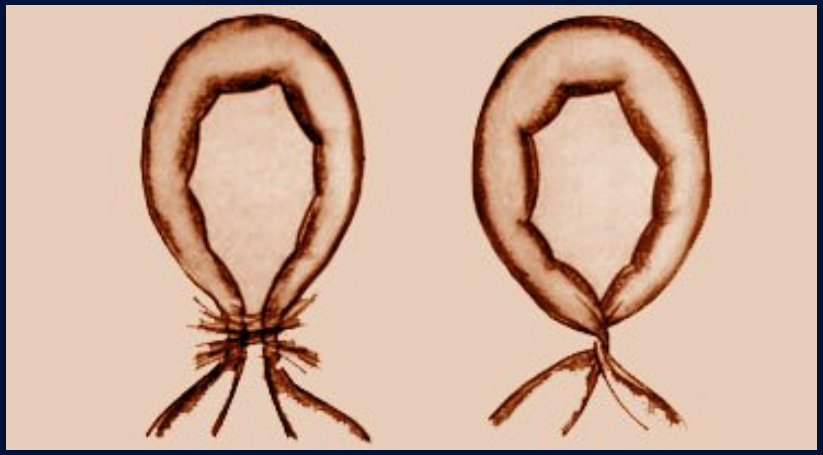
Mechanical intestinal obstruction



Mechanical extraluminal obstruction (→)
Twisted small bowel around adhesion



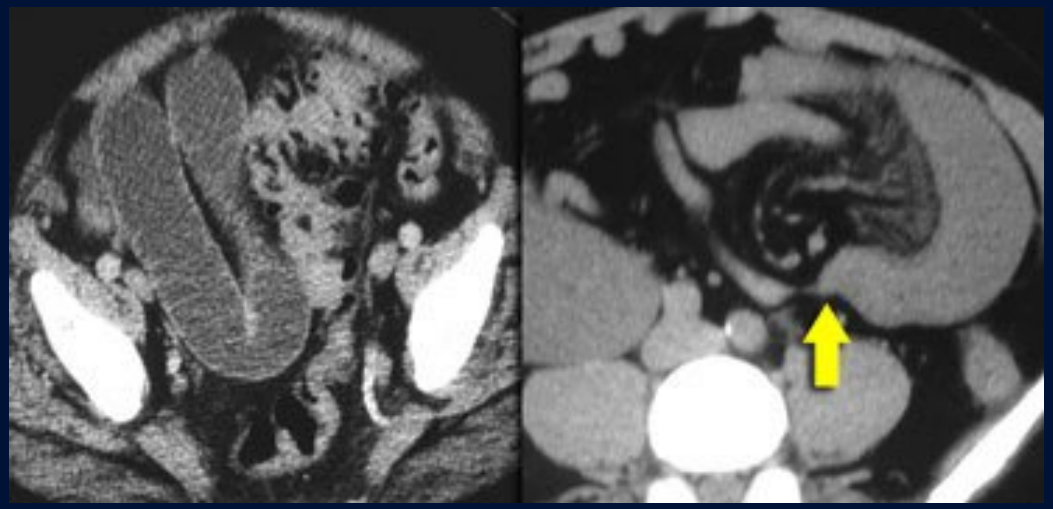
Mechanical extraluminal obstruction (→)
Adhesion inducing intestinal obstruction



Closed loop obstruction is a specific type of obstruction in which two points along the course of a bowel are obstructed at a single location thus forming a closed loop.

Strangulation in SBO

- Simple obstruction (90%)
- Strangulation obstruction (10%)
  - Vascular compromise
  - Mortality rate: 10-37%
  - Most are closed loop

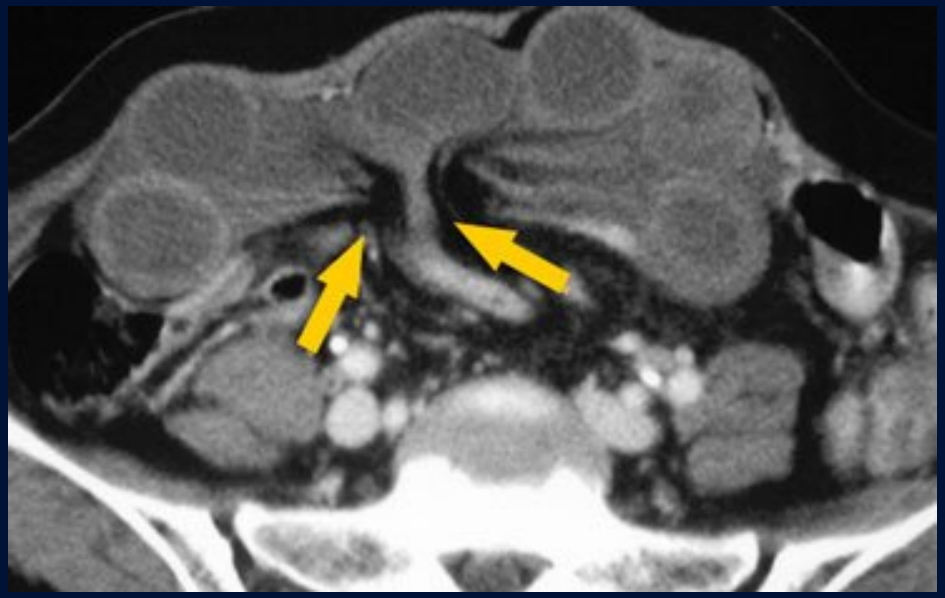


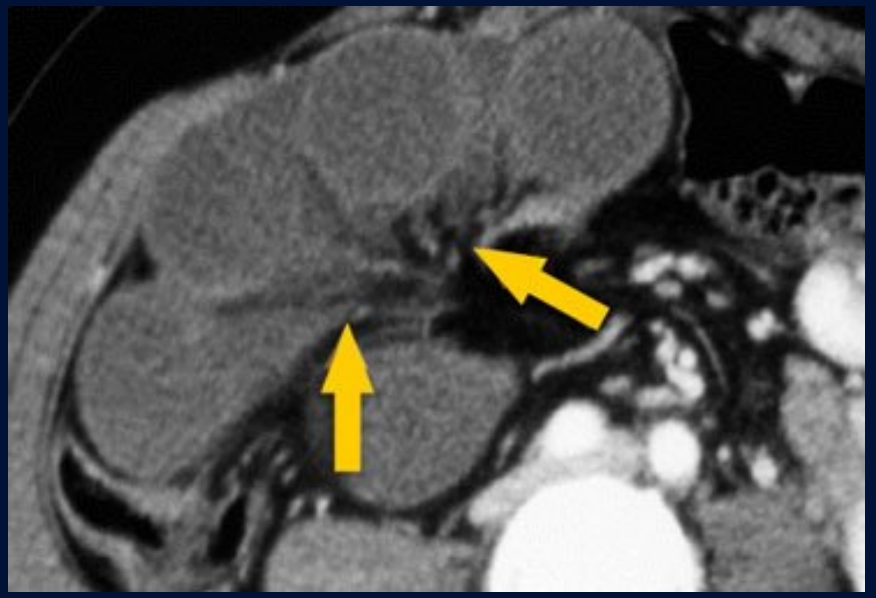
The CT-presentation of a closed loop obstruction in the small bowel depends on two things:

• length of the bowel segment that forms the closed loop

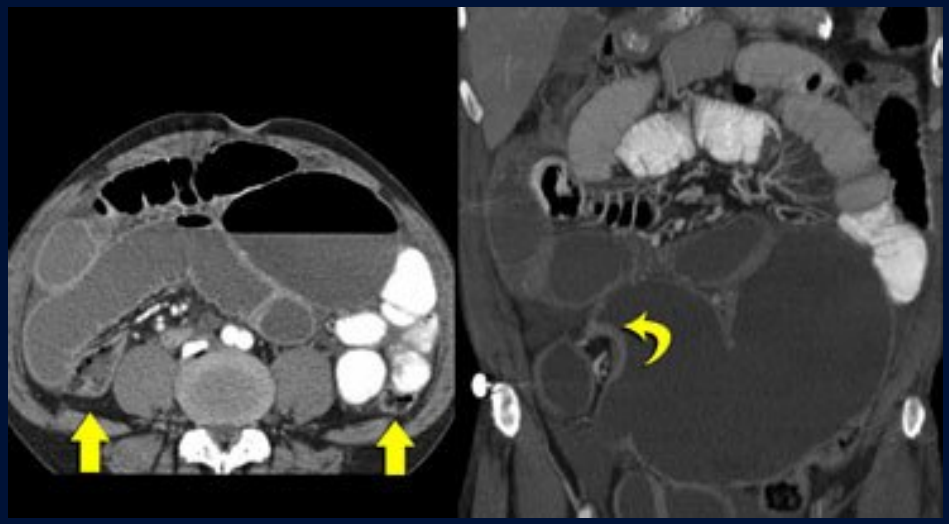
• orientation of the loop in relation to the imaging plane

If we have a short closed loop oriented within the plane of imaging, we will see a U- or C-shaped loop of bowel.

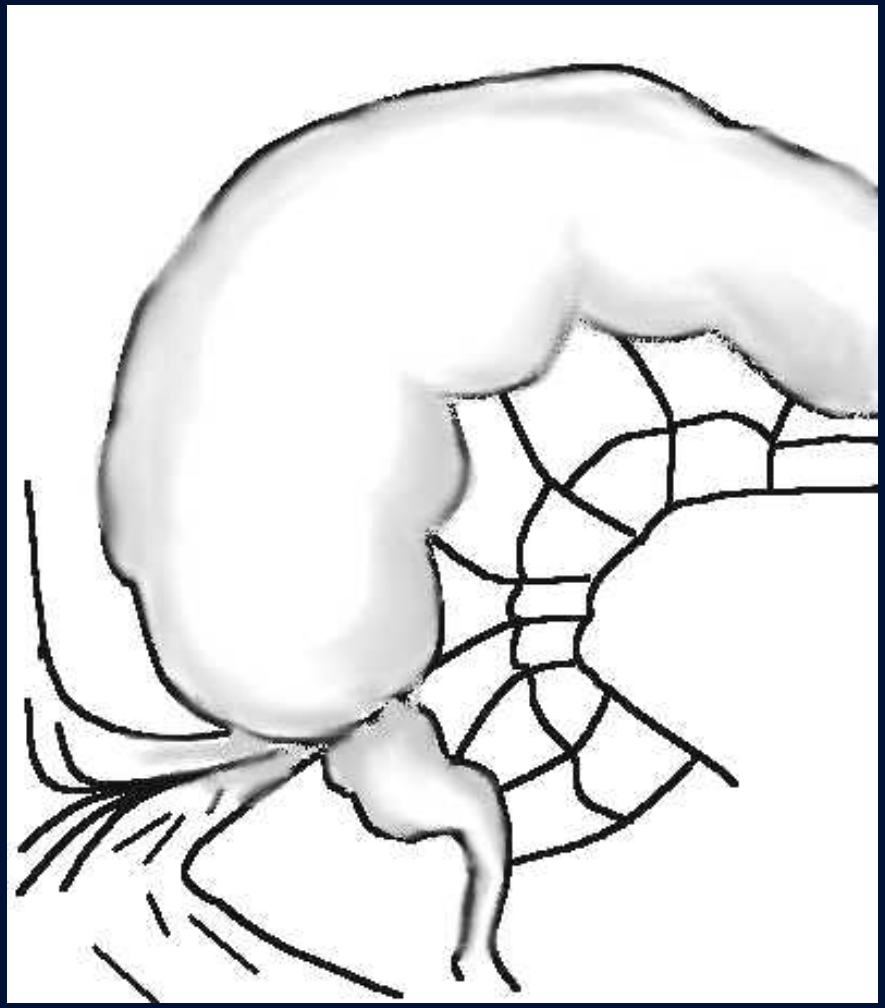




Another important appearance of a closed loop obstruction is that of a radial array of dilated small bowel loops with the mesenteric vessels converging to a central point. This is almost always due to a small bowel volvulus.



Non-dilated ascending and descending colon (straight arrows) and the transition point of the volvulus – “beak sign”(curved arrow).

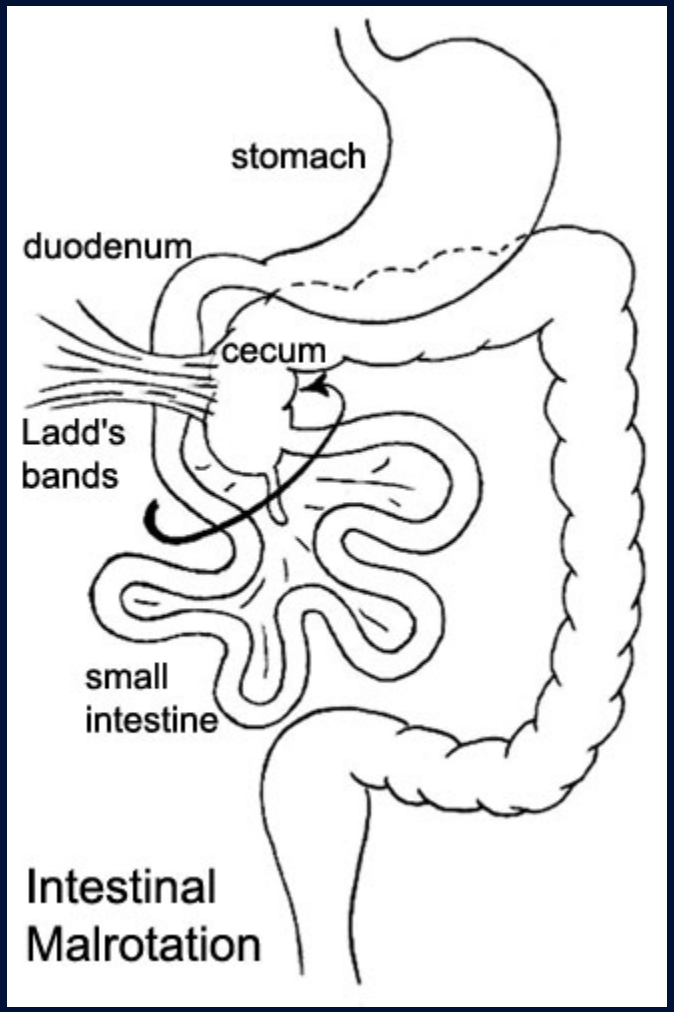


A band adhesion across the ileum following for instance, appendicitis with appendectomy will result in an open loop obstruction.

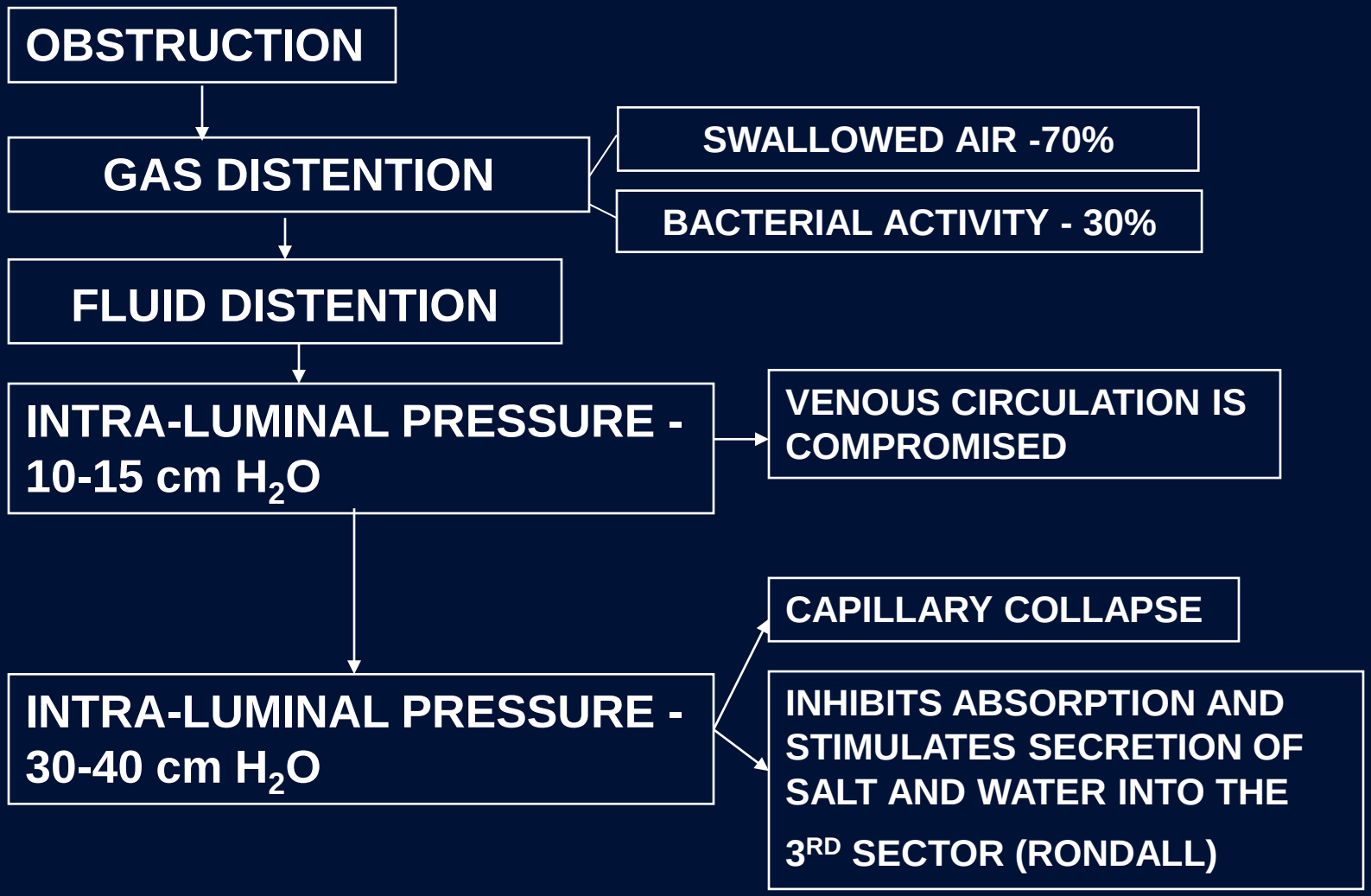
Intestinal malrotation is a congenital anomaly of rotation of the midgut (embryologically, the gut undergoes a complex rotation outside the abdomen). As a result:

The small bowell is found predominantly on the right side of the abdomen the cecum is displaced (from its usual position in the right lower quadrant) into the epigastrium – right hypocondrium the ligament of Treitz is displaced inferiorly and rightward, fibrous bands (of Ladd) course over the horizontal part of the duodenum (DII), causing intestinal obstruction.

The small intestine has an unusually narrow base, and therefore the midgut is prone to volvulus (a twisting that can obstruct the mesenteric blood vessels and cause intestinal ischemia).



PATHOPHYSIOLOGY OF INTESTINAL OBSTRUCTION



Na

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ALDOSTERON

↑ ↑

Na | Cl | K

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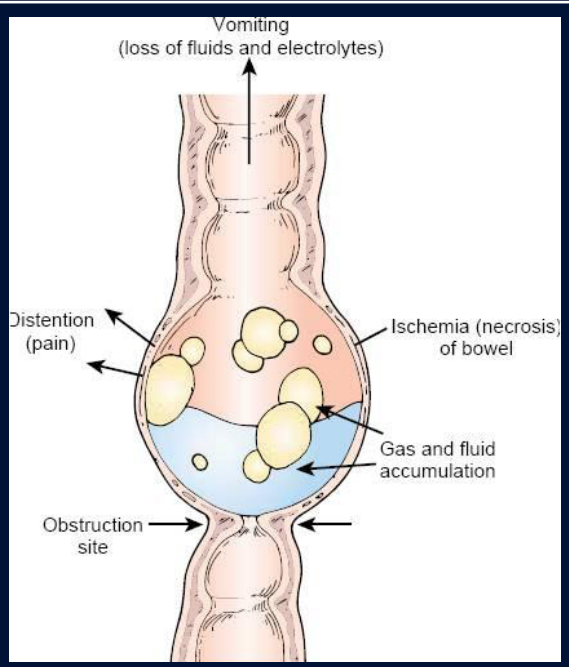
HYPOKALEMIA

INTRA-LUMINAL PRESSURES - 50-60 cm H_2O



↑

ARTERIAL ISCHEMIA OF THE BOWEL WALL

↓

INTESTINAL WALL BECOMES PERMEABLE FOR MICROORGANISMS AND BACTERIAL ENDOTOXINS (bacterial translocation)

↓

IMBALANCES OF PROTEIN METABOLISM

↓

PROTEIN DEGRADATION

↓

HYPERKALEMIA

PATHOPHYSIOLOGY OF INTESTINAL OBSTRUCTION

General Effects of Acute Intestinal Obstruction:

1- Dehydration caused by: (a) Repeated vomiting,
(b) Fluid and blood accumulation in the intestinal lumen, wall and peritoneal cavity.

2- Shock.

3- Myocardial damage caused by Potassium loss due to vomiting

4- Acute toxaemia due to septic peritonitis.

The first report regarding Intra-Abdominal Hypertension (IAH) was published by Wendt E. in 1867.

Wendt E. Arch Physiol Heilkd 1867; 527–575.

The term of Abdominal Compartment Syndrome (ACS) was initially used by Kron IL *et al.* in 1984.

Kron IL et al. Ann Surg 1984; 199: 28–30.

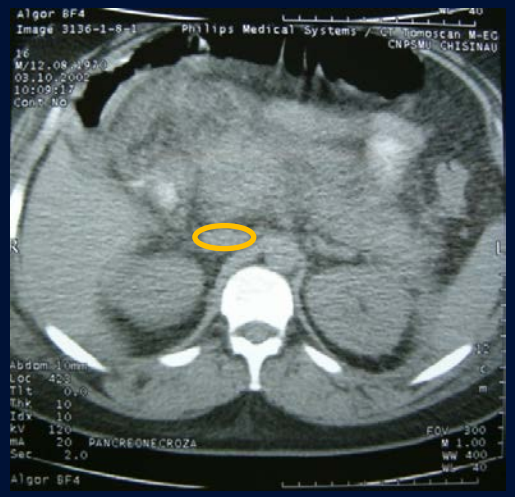
What is IAH and ACS?

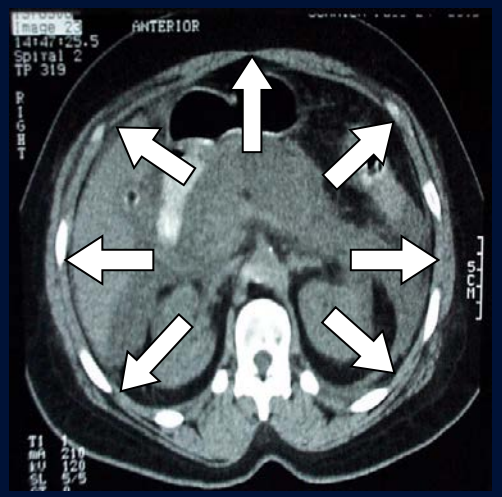
Intra-abdominal hypertension represents an elevation of the intra-abdominal pressure (IAP) over 12 mmHg.

Malbrain ML et al. Intensive Care Med 2006;32:1722–1732

Abdominal Compartment Syndrome (ACS) represents persistent IAP > *20 mmHg* associated with *de novo* diagnosed organ dysfunction/insufficiency

Balogh ZJ et al. World J Surg. 2009;33:1134-41.





"Abdominal Perfusion Pressure (APP) = Mean Arterial Pressure (MAP) minus Intra-abdominal Pressure (IAP) = MAP - IAP"

www.wsacs.org

$$MAP = \frac{SBP + 2\,(DBP)}{3}$$

$$MAP = 1/3\,(SBP - DBP) + DBP$$

Normal IAP is 6.5 mmHg, with the limits between 0.2 and 16.2 mmHg

Joshi GP. Anesthesiol Clin North America 2001; 19: 89–105.

Symptoms include:

Cramping and belly pain that comes and goes.

The pain can occur around or below the belly button.

Sudden severe colicky pain:

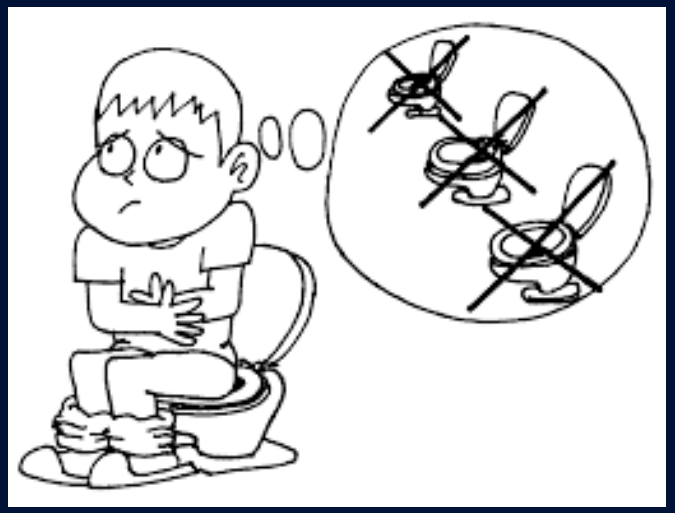
In small bowel : central

In large bowel : lower abdomen

Bloating.

Vomiting: The higher the obstruction the earlier it appears and more profuse it is.

The nature of the vomits depend on the level of obstruction.



Constipation and a lack of gas, if the intestine is completely blocked.

Diarrhea, if the intestine is partly blocked.

Constipation:

Absolute (no feces nor flatus is passed) or relative (only flatus is passed).

Early in large bowel but late in small bowel obstruction.

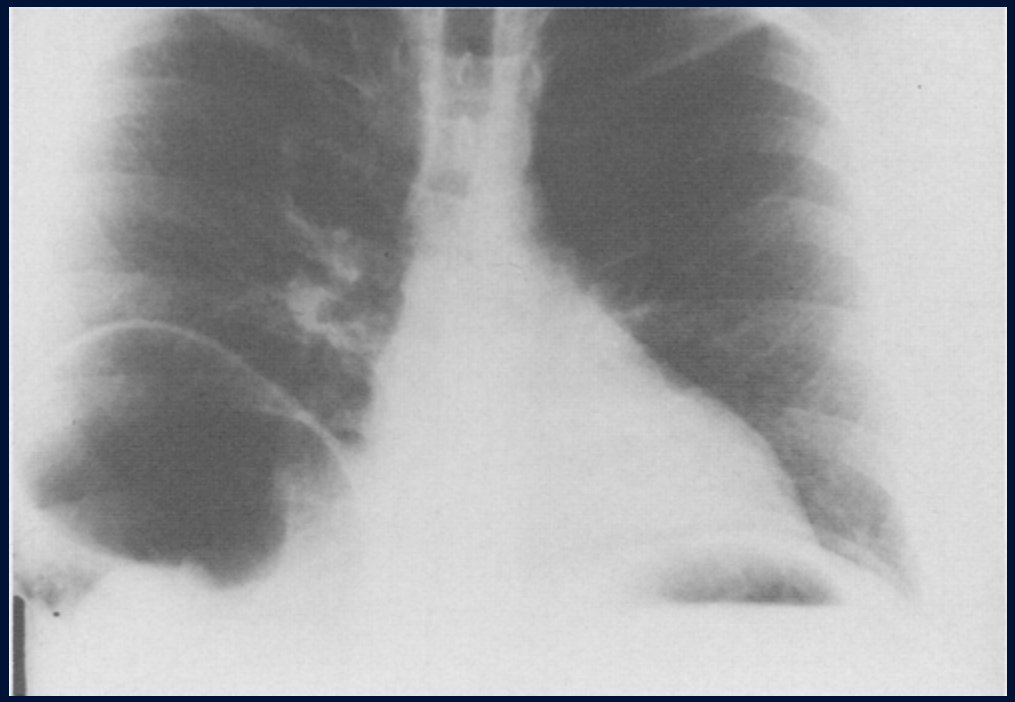
Physical examination: postoperative scars, abdominal distension hyperactive peristalsis and abdominal asymmetry.

abdominal distension and abdominal asymmetry

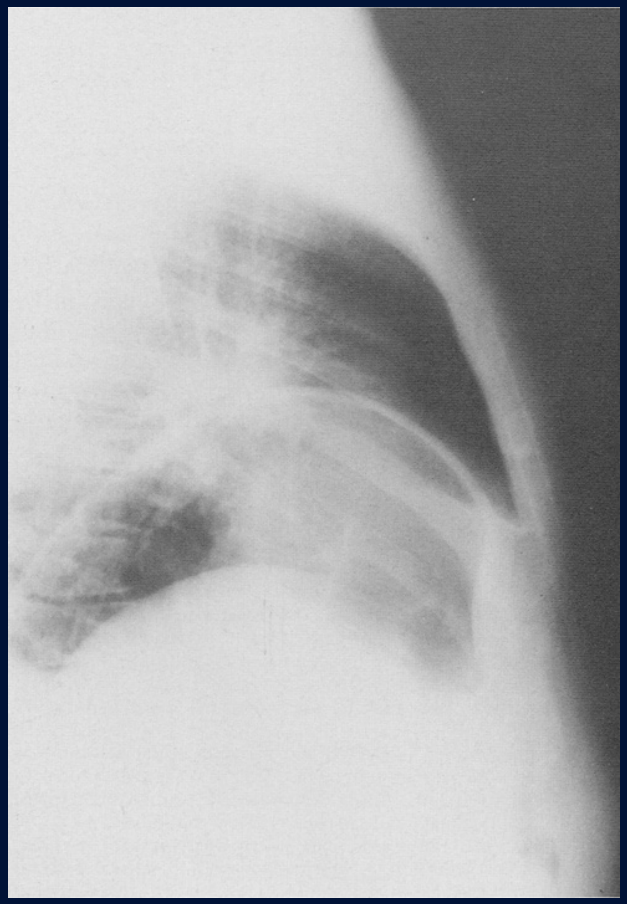
Physical examination: hyperactive peristalsis (**König's syndrome**) gurgling sounds (hyper-peristalsis) on auscultation (especially in the right iliac fossa), and abdominal distension.

Percussion: Generalized abdominal tympanic sound, especially above the asymmetric site.

Hepatodiaphragmatic interposition of the colon (Chilaiditi's syndrome).



Characteristic radiologic features of symptomatic interposition: 1) elevation of right hemidiaphragm; 2) distended, fixed interposed hepatic flexure; and 3) downward displacement of the liver



Lateral chest radiograph reveals haustral markings in the interposed colon.

Palpation:

Examination of the typical hernia sites (strangulated hernia?).

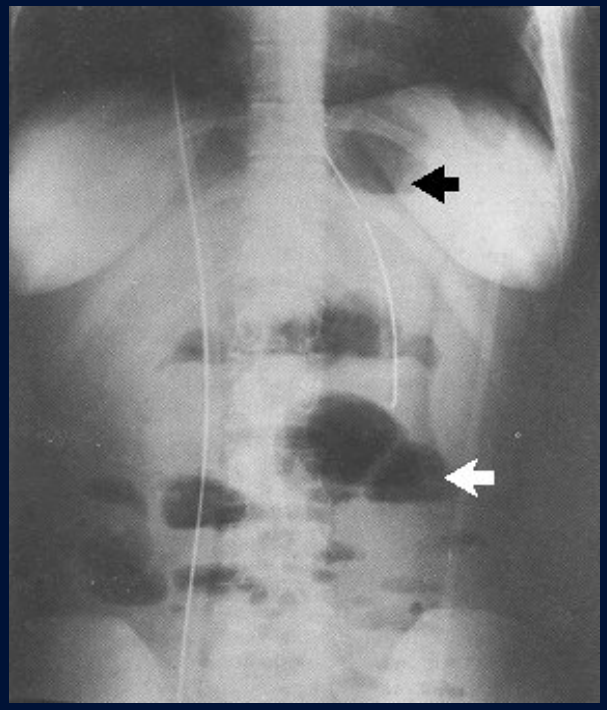
Rigidity of the anterior abdominal wall – peritonitis? strangulated intestinal loop?

Palpable mass – obstructing tumor?

Auscultation: reveal periods of increasing bowel sounds with periods of relative quiet. With obstruction, the bowel sounds are usually high-pitched or musical.

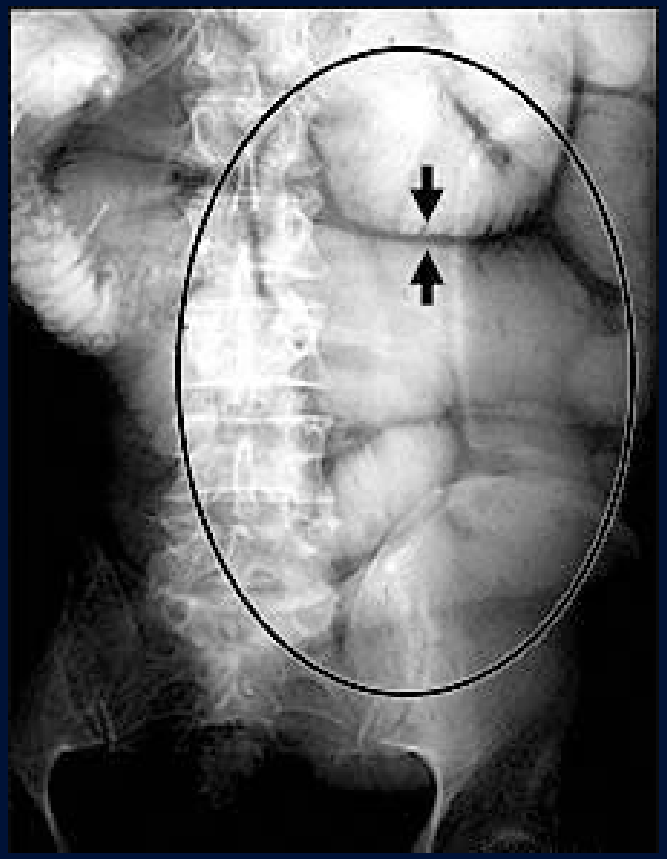
In cases of prolonged obstruction and ileus, bowel sounds may disappear as a consequence of decreased motility.

RECTAL EXAMINATION must not be forgotten!



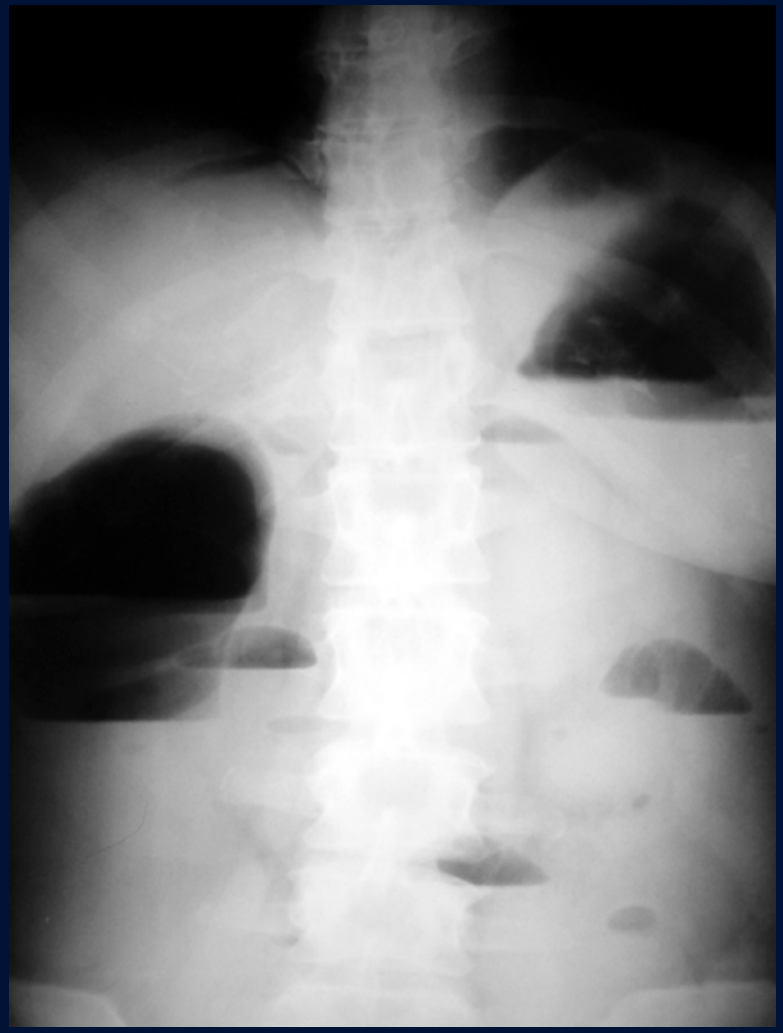
X-rays of the abdomen are important in diagnosing the presence of small bowel obstruction. When obstruction occurs, both fluid and gas collect in the intestine. They produce a characteristic pattern called "air-fluid levels". The air rises above the fluid and there is a flat surface at the "air-fluid" interface.

KLOIBER'S SIGN

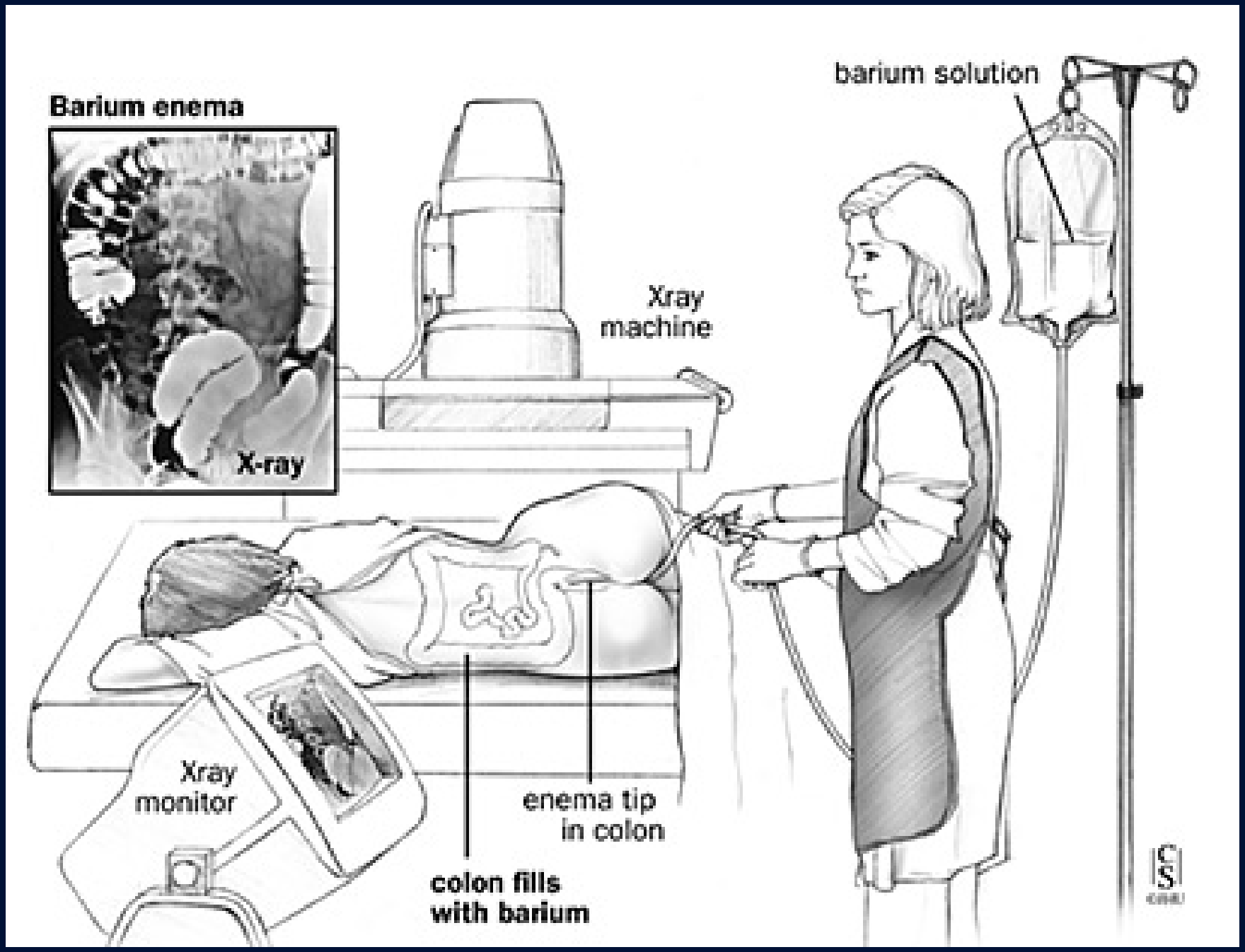


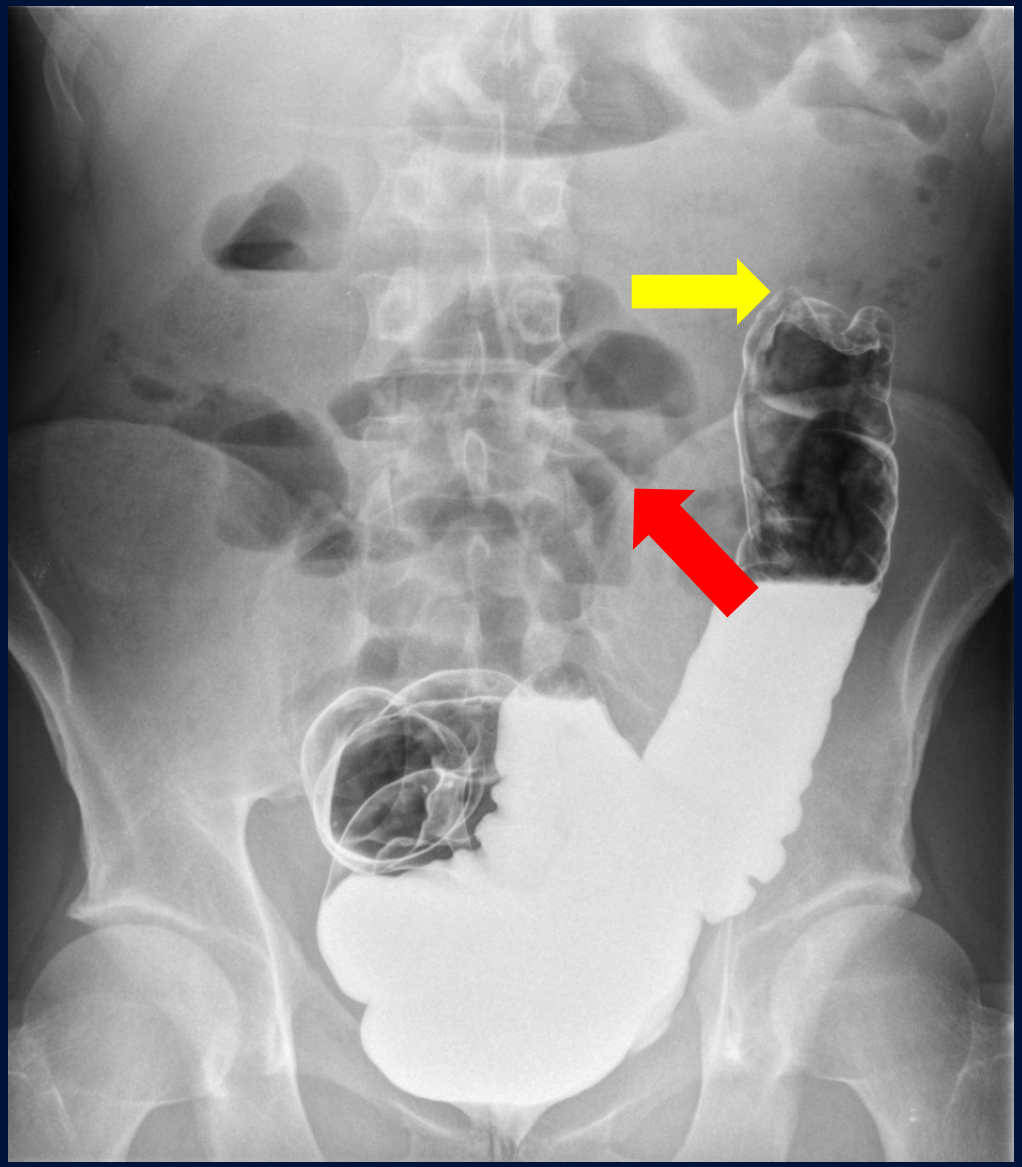
Abdominal x-ray shows thickening of the bowel wall and swelling (distention) caused by a blockage (obstruction) in the intestines. A solution containing a dye (barium), which is visible on X-ray, was swallowed by the patient (the procedure is known as an upper GI series).

Simple abdominal x-ray – multiple air-fluid levels (small bowel obstruction).



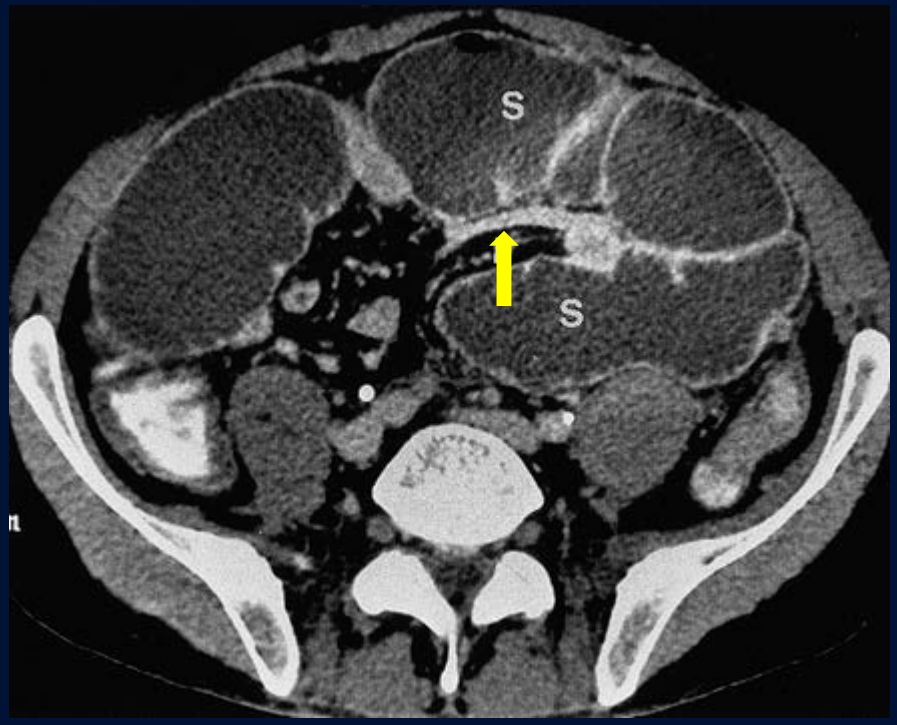
Simple abdominal x-ray – large air-fluid levels localized on both flanks (colon obstruction).


Barium enema
X-ray
barium solution
Xray machine
Xray monitor
enema tip in colon
colon fills with barium

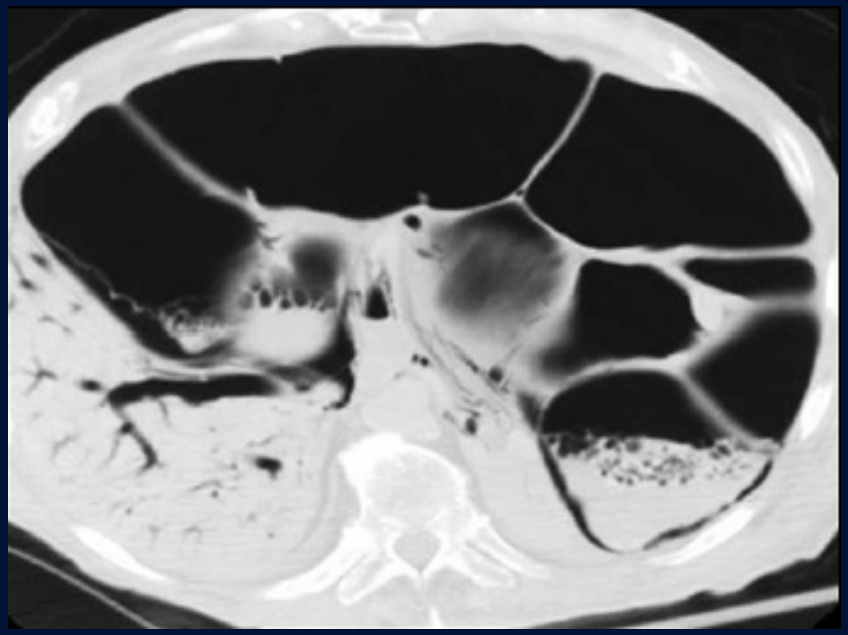


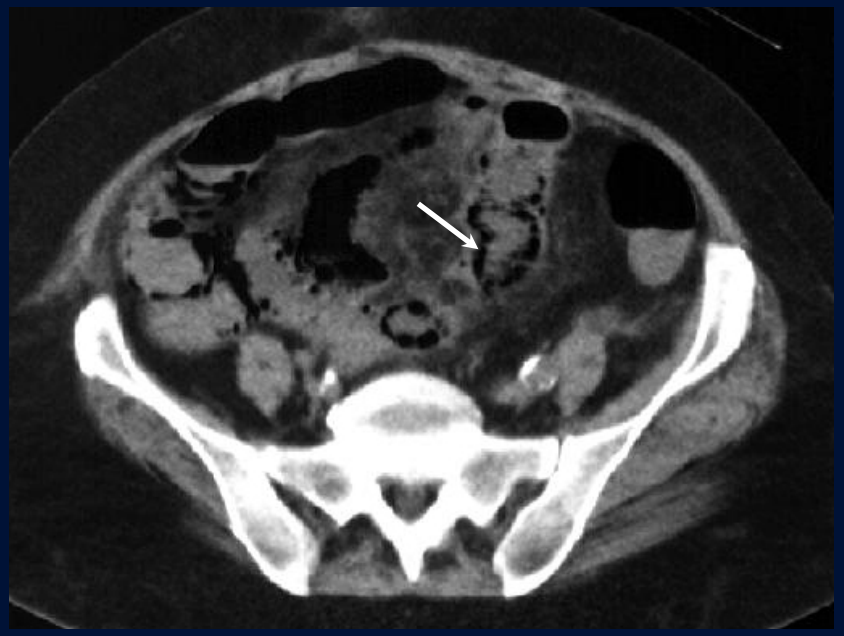
Barium enema – Colon Obstruction (→) due to colon carcinoma. Air-fluid levels on the small intestine (→)

Simple complete small bowel obstruction caused by adhesions. CT scan shows the small bowel (*I*) with marked distention and filled with fluid and air. Totally collapsed bowel loops are seen at the transition zone (*C*).

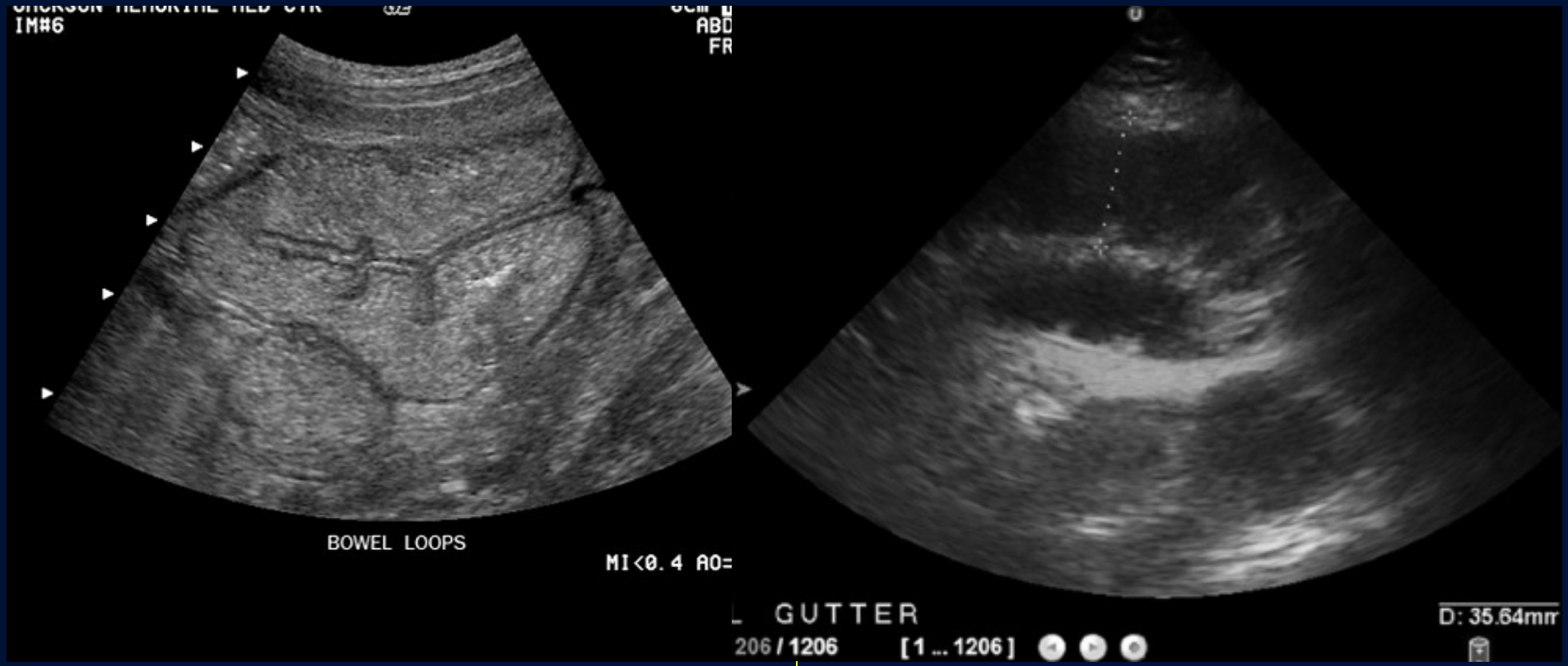


Closed-loop small bowel obstruction.
Contrast material-enhanced abdominal CT scan shows dilatation of a small bowel loop (*S*). The beak sign is seen at the obstructed site (arrow).





CT – dilated intestinal loops, gas within the intestinal wall (arrow)



Longitudinal scan of the lower abdomen reveals multiple distended bowel loops. Fecal material and air pockets are seen throughout the dilated bowel loops. Mural thickening and edema of hausstra are seen to invaginate the distended bowel.

(1) the presence of fluid-filled, dilated bowel (defined as > 25mm) proximal to normal or collapsed bowel.

(2) decreased or absent bowel peristalsis (defined as back and forth movements of spot echoes inside the fluid-filled bowel).

Gall-stone induced small bowel obstruction (GSO) is an uncommon complication of cholelithiasis, accounting for 1-4% of mechanical bowel obstructions, this condition being described mostly in elderly.

Lassandro F. et al.: Eur J Radiol 2004; 50: 23-29.

The GSO frequency is up to 25% of all nonstrangulated small bowel obstructions in patients over 65 years, female patients being more frequently affected.

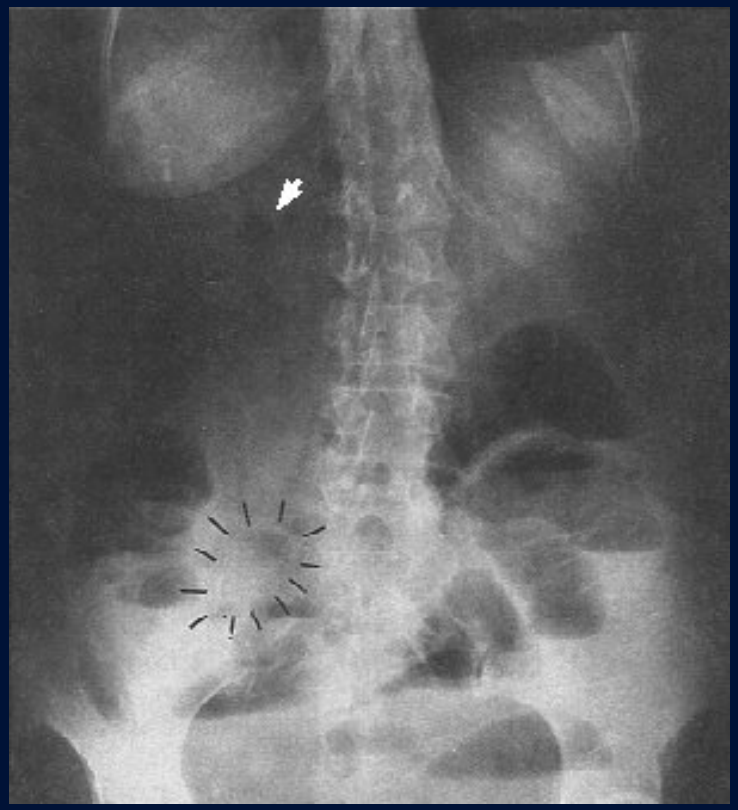
Kirchmayr W. et al.: ANZ J Surg 2005; 75: 234-38.

Despite the increase of the reported cases recently due to high suspicion index and improved diagnostic imaging techniques, GSO represents a significant diagnostic and treatment challenge.

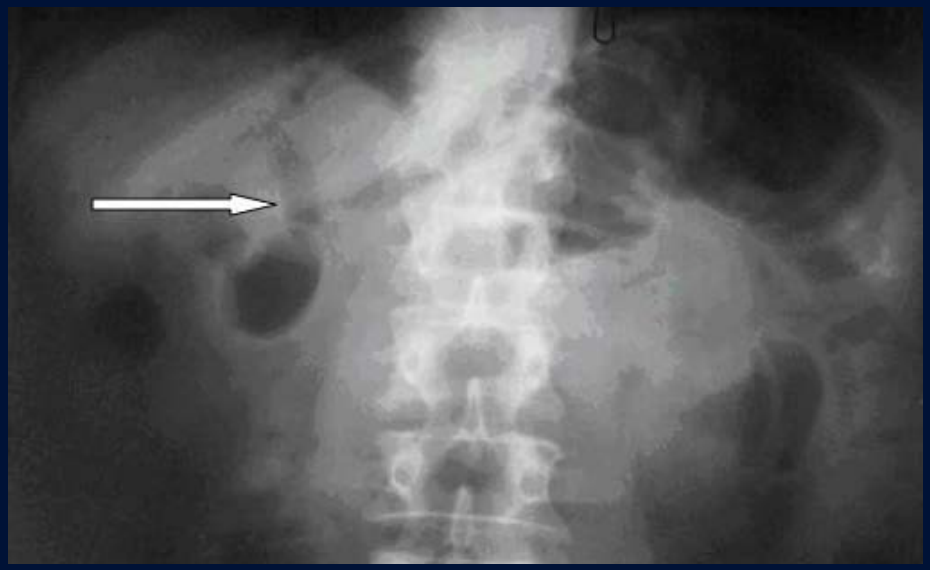
Ayantunde AA. et al.: World J Surg 2007; 31: 1292-97.

The most common stone impaction site include the terminal ileum (85%), ileocecal valve and rarely the jejunum, colon or duodenum (Bouveret's syndrome), although stone impaction site can be anywhere in the gastrointestinal tract.

Ayantunde AA. et al.: World J Surg 2007; 31: 1292-97.



Rigler's triad (pneumoblia, ectopic gall-stone and mechanical bowel obstruction) on a plain abdominal radiograph.

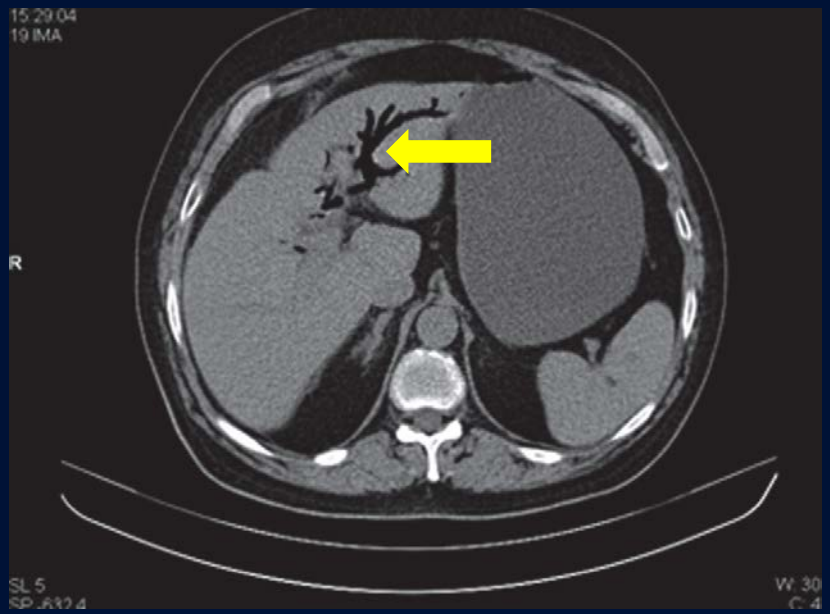


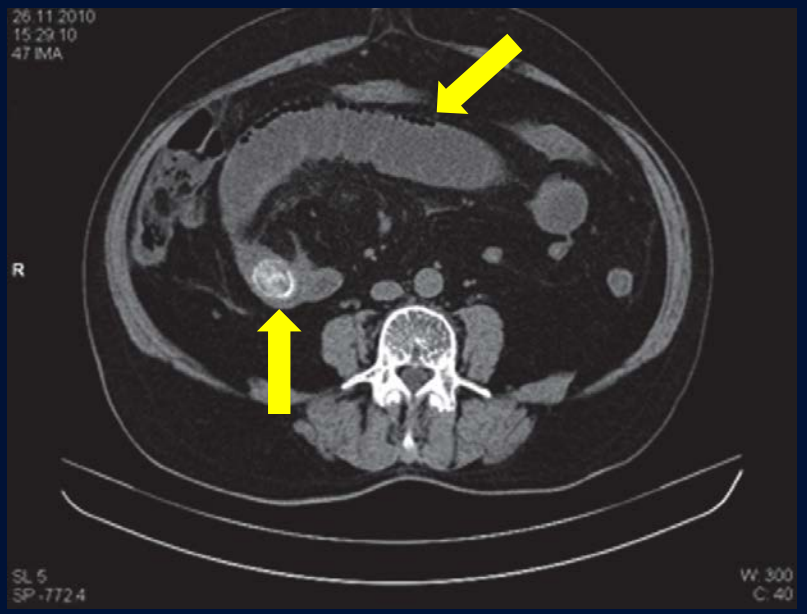
Bouveret's syndrome is a rare clinical entity consisting of duodenal obstruction secondary to the passage of stones from the gallbladder to the duodenum through a biliodigestive fistula.

1. **Large gallstone in the gallbladder:**
2. **Large diameter inner biliodigestive fistula:**
3. **The presence of significant stenosis in the the intestine.**

Plain abdominal X ray is helpful to diagnose intestinal obstruction, including GSO, although the classical Rigler's triad occurs in less than 50% of cases.

Lassandro F. et al.: Eur J Radiol 2004; 50: 23-29.





Mishin I. et al.: Polish Journal of Surgery 2011; 83 (4): 223-6.

Up to date the CT scan is widely accepted as the investigation of choice in the diagnosis of bowel obstruction, since it can effectively show the site and etiology of the intestinal obstruction. In GSO, CT allows to determine the obstruction site, gall-stone size, as well as the presence of biliary-enteric fistula.

Yu CY. et al.: World J Gastroenterol 2005; 11: 2142-47.

The following conditions should be considered in the differential diagnosis of small-bowel obstruction:

- Esophageal rupture or tear
- GI foreign body
- Gastroenteritis
- Inflammatory bowel disease
- Mesenteric ischemia
- Large-bowel obstruction
- Ovarian torsion
- Pancreatitis
- Acute appendicitis
- Diabetic ketoacidosis
- Intussusception
- Pelvic inflammatory disease
- Urinary Tract Infection

Emergency Department (ED) care:

1. Initial ED treatment consists of aggressive fluid resuscitation, bowel decompression, administration of analgesia and antiemetic as indicated clinically, early surgical consultation, and administration of antibiotics. (Antibiotics are used to cover against gram-negative and anaerobic organisms.)

2. Initial decompression can be performed by placement of a nasogastric (NG) tube for suctioning GI contents and preventing aspiration. Monitor airway, breathing, and circulation (ABCs).

3. Blood pressure monitoring, as well as cardiac monitoring in selected patients (especially elderly patients or those with comorbid conditions), is important.

1. Intravenous infusions (fluid replacement). Volume? (4:2:1)
2. Nasogastric tube – decompression.
3. Urinary catheter – urine output monitoring.

A nonoperative trial of as many as 3 days is warranted for partial or simple obstruction.
Provide adequate fluid resuscitation and NG suctioning. Resolution of obstruction occurs in virtually all patients with these lesions within 72 hours.
Good data regarding nonoperative management suggest it to be successful in 65-81% of partial small-bowel obstruction (SBO) cases without peritonitis.

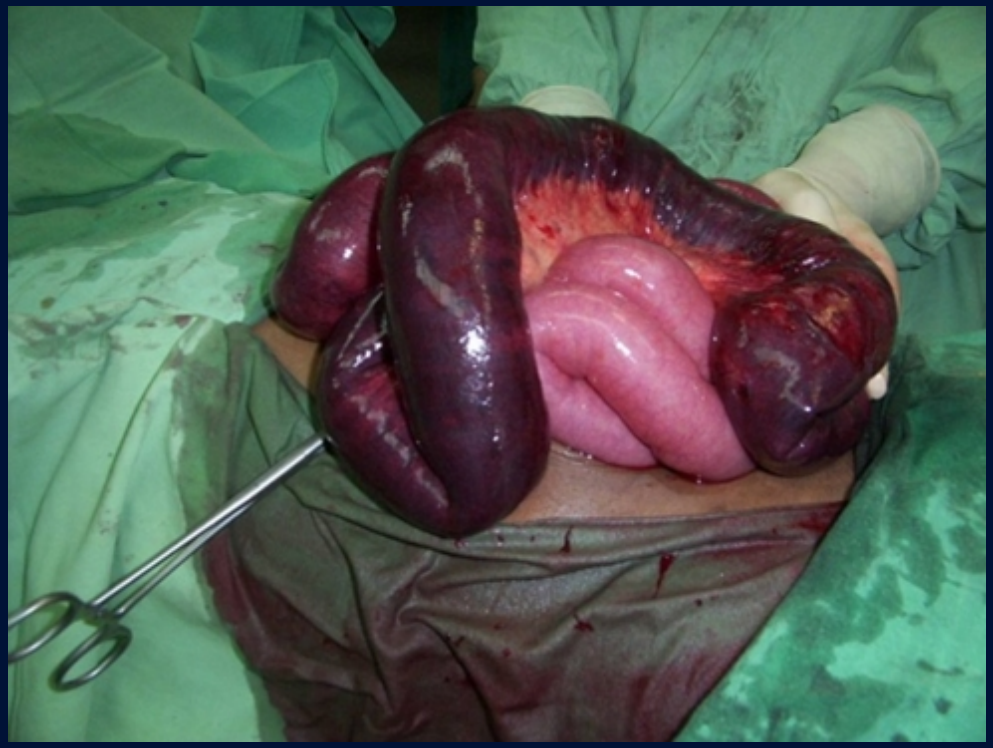
Diaz JJ Jr., et al.: *J Trauma*. 2008;64(6):1651-64.

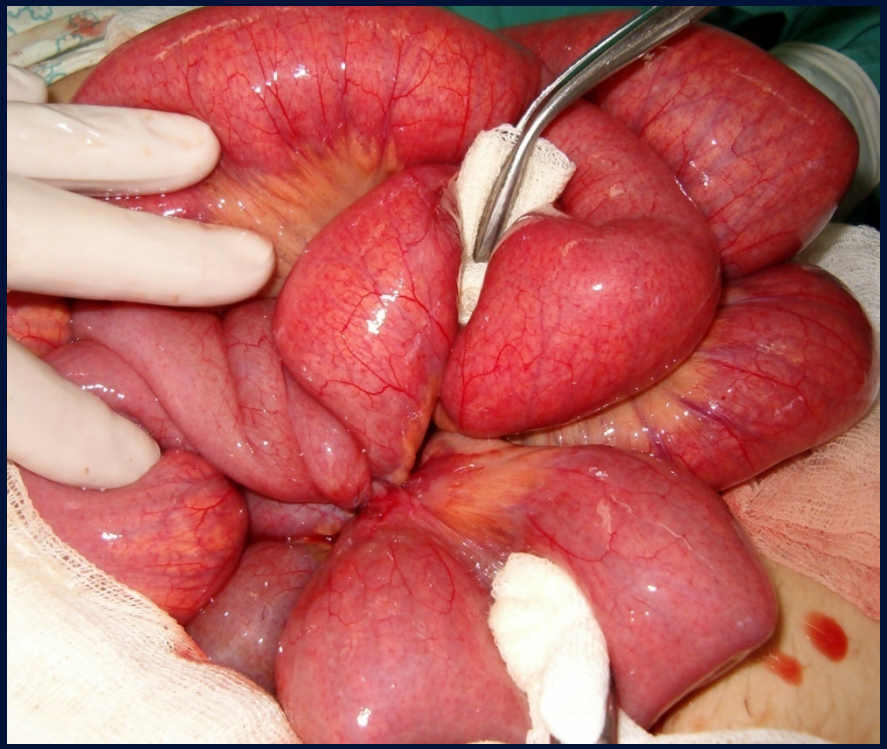
Most bowel obstructions are partial blockages that get better on their own. Some people may need more treatment. These treatments include using liquids or air (enemas) or small mesh tubes (stents) to open up the blockage.

Surgery is almost always needed when the intestine is completely blocked or when the blood supply is cut off.

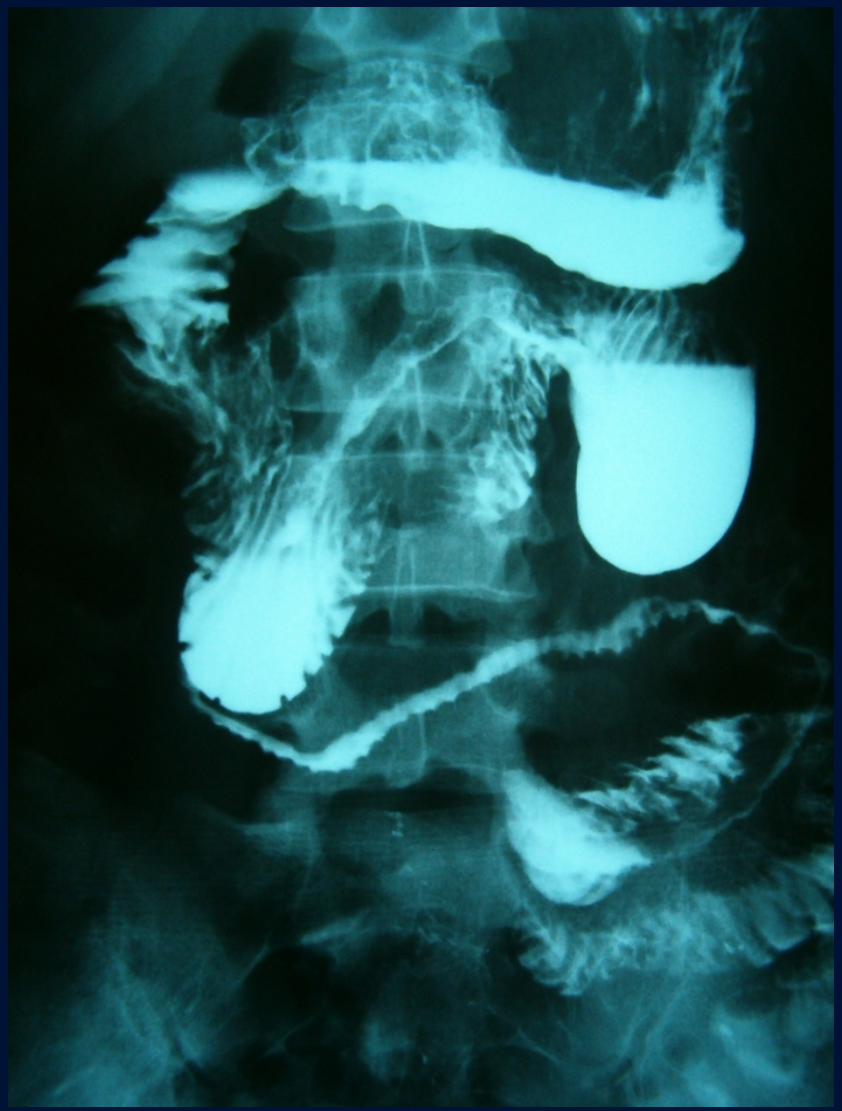
What is the volume of surgery?

Is the intestinal loop viable?

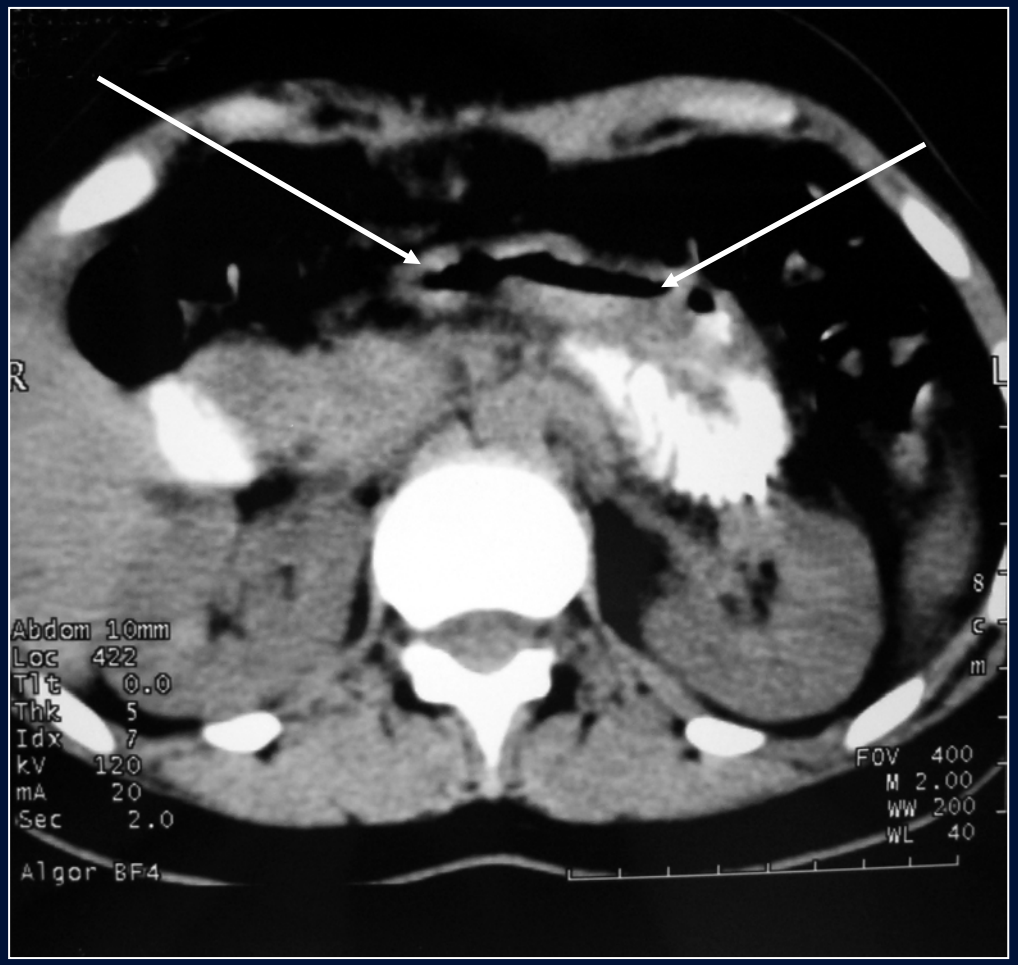




Serosa – glossy rose color
Peristalsis – present
Arterial pulsation - present

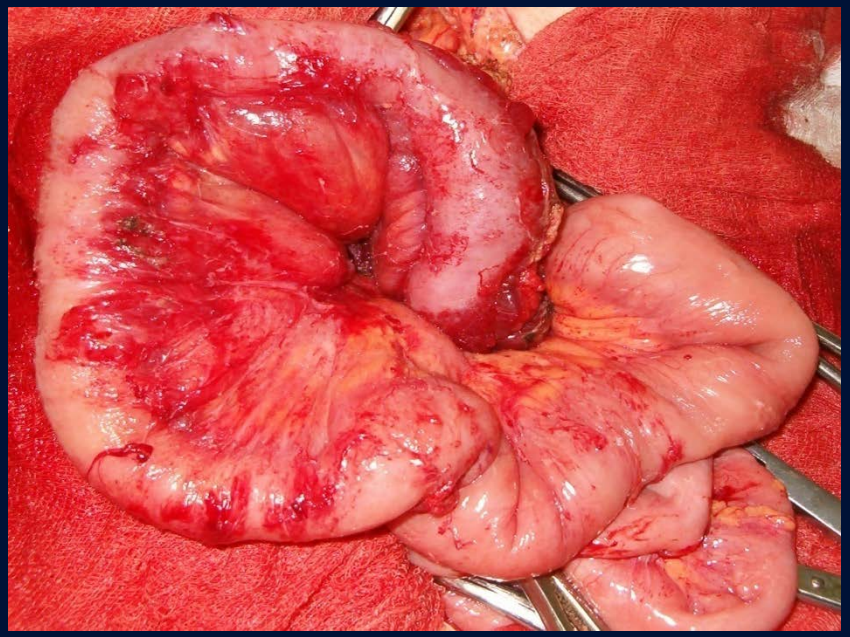


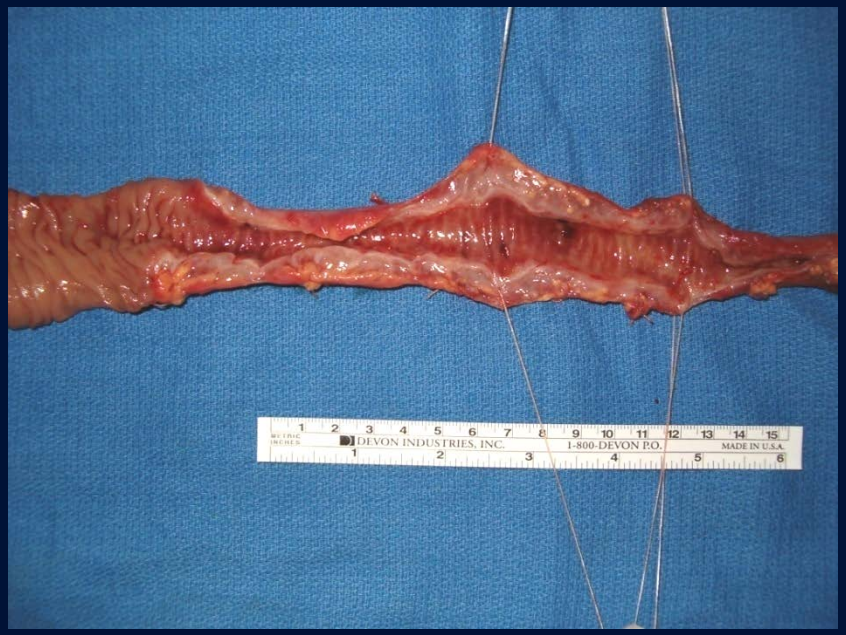
Contrast X-ray demonstrating a long stricture of proximal jejunum.



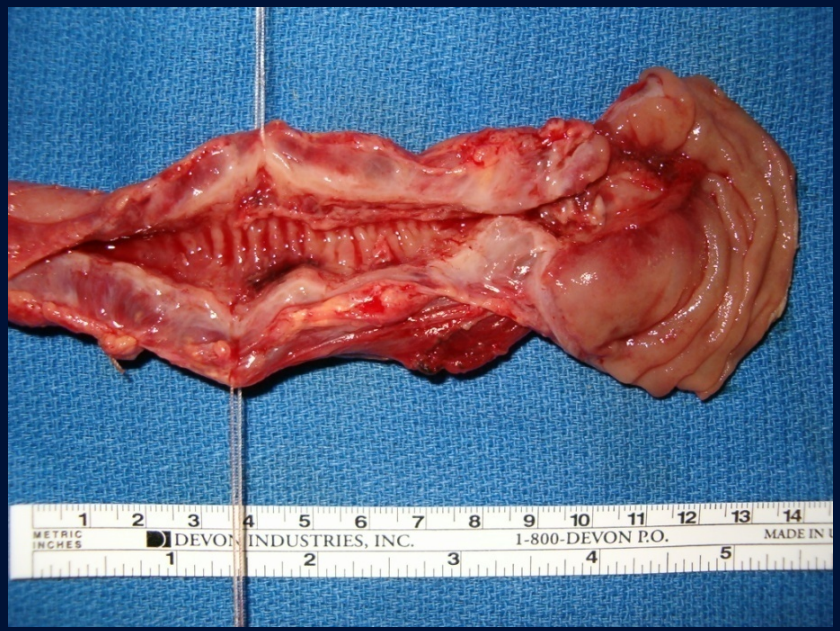
Abdominal CT scan revealing a stenotic thickened area in the first loop of the jejunum.

Ghidirim G., Gagauz I., Mishin I., Vozian M., Zastavnitsky G. J Gastrointestin Liver Dis. 2008;17(1):114-5.

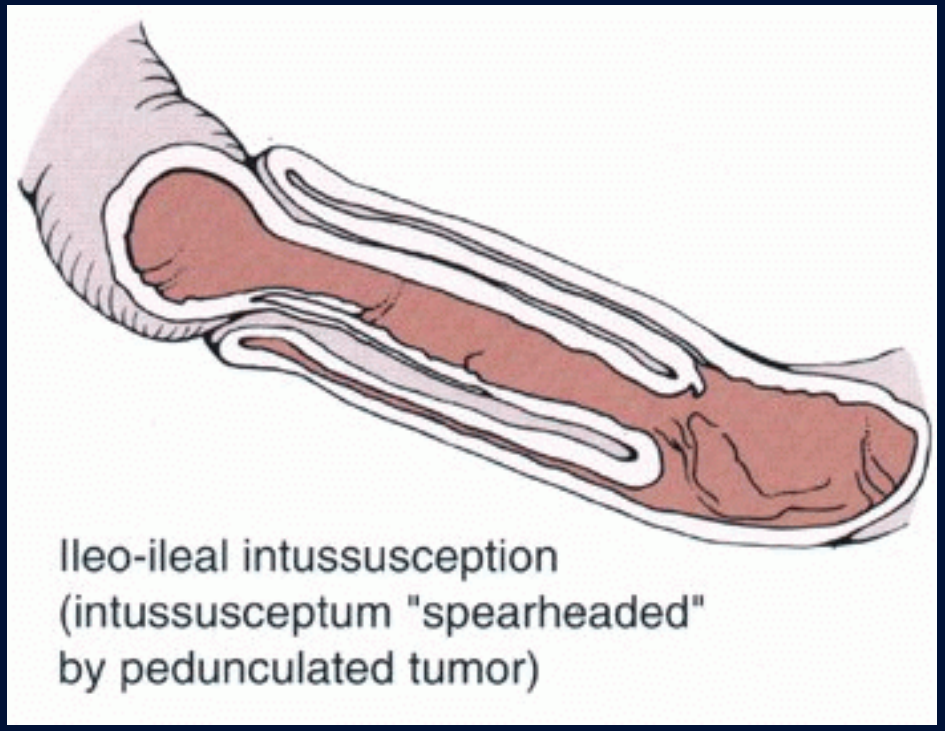




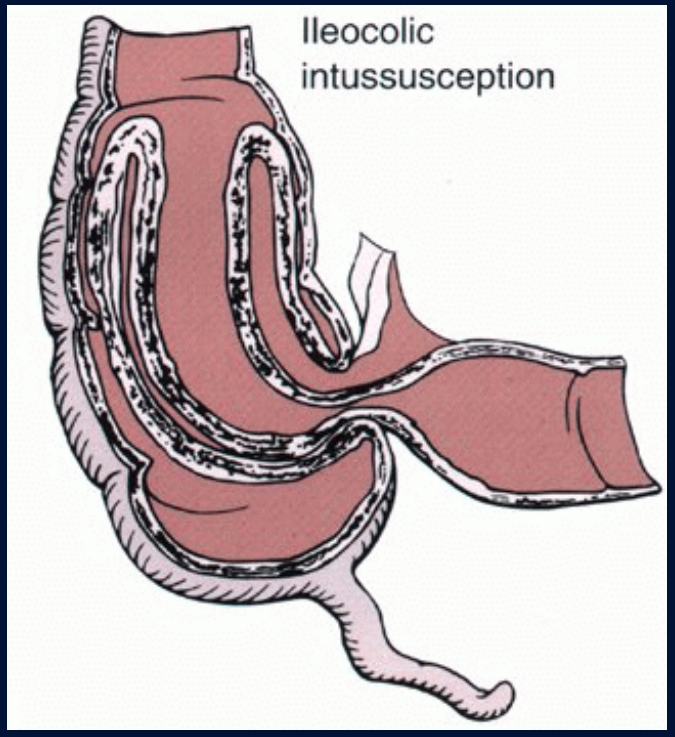
Intraoperative view and resected specimen - a loop of jejunum with fibrotic wall and stenotic lumen.

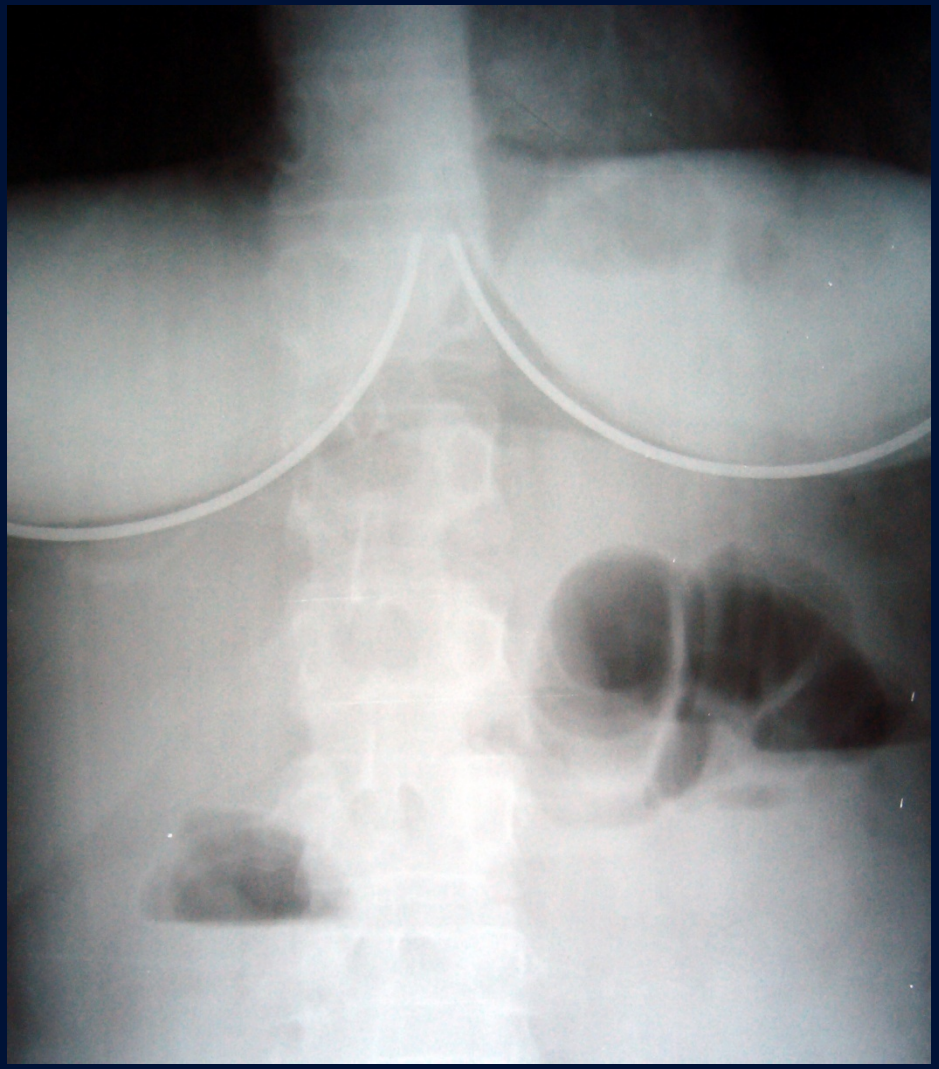


Ghidirim G., Gagauz I., Mishin I., Vozian M., Zastavnitsky G. J Gastrointestin Liver Dis. 2008;17(1):114-5.



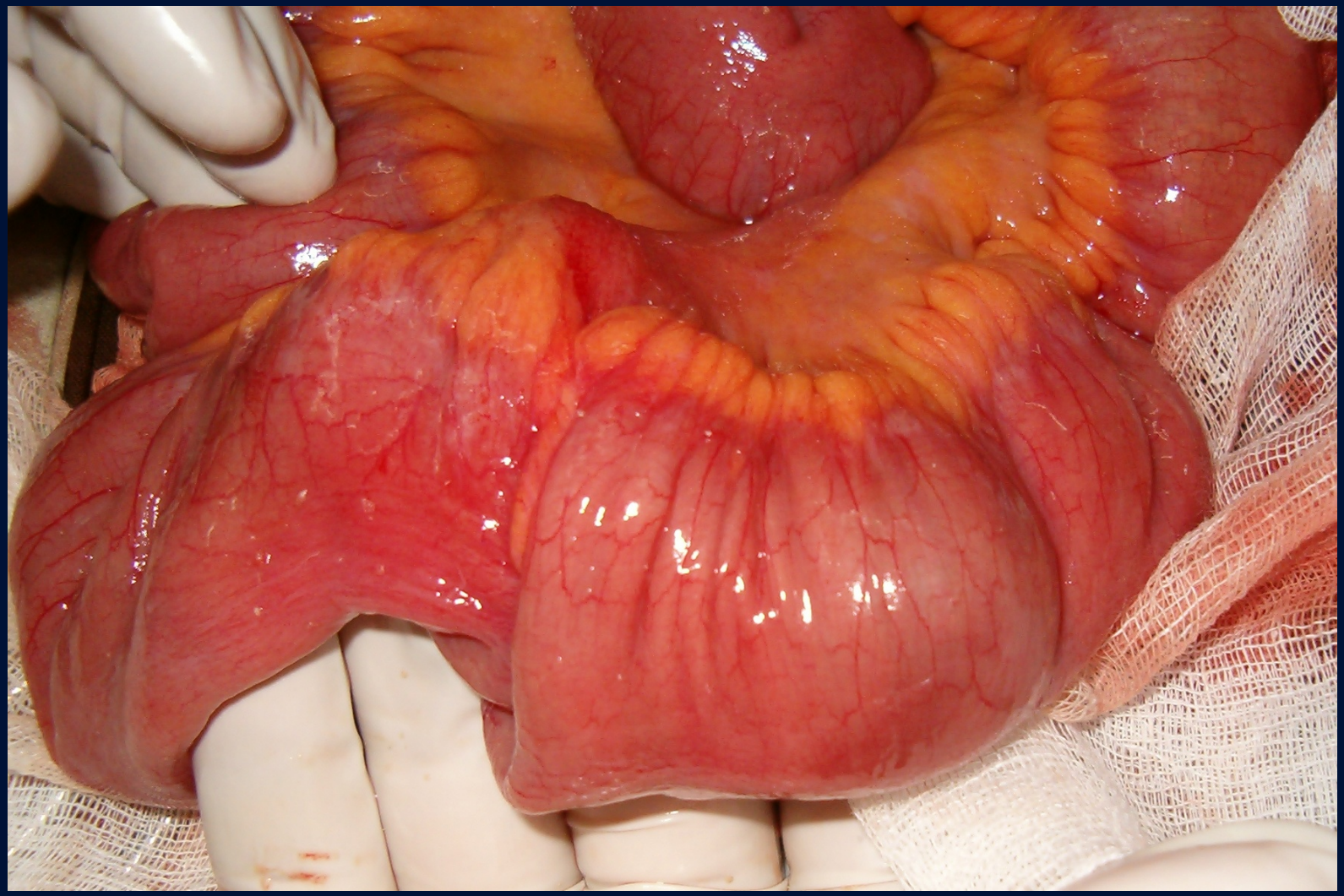
Ileo-ileal intussusception
(intussusceptum "spearheaded"
by pedunculated tumor)



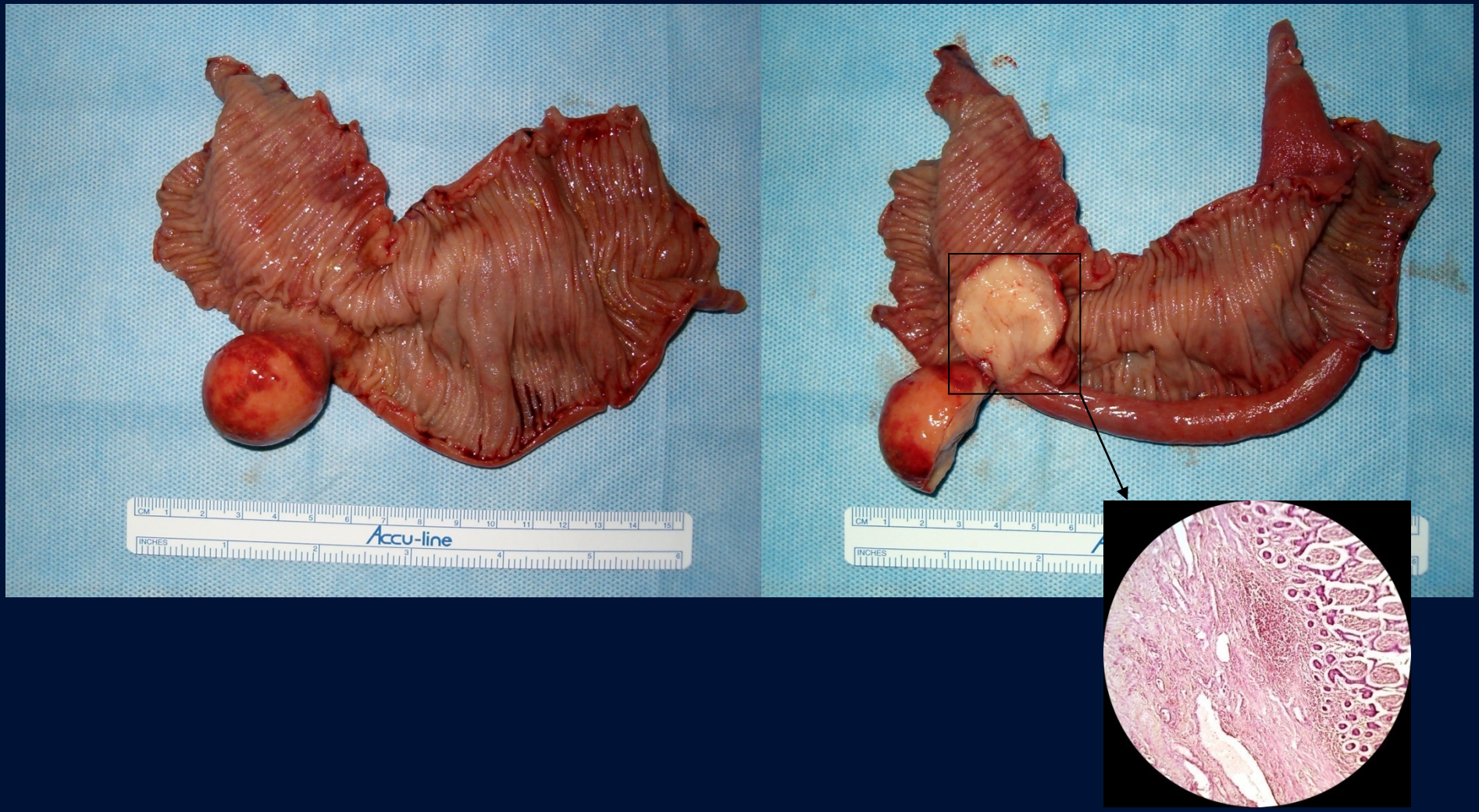


Simple abdominal x ray (air-fluid levels)
SBO obstruction

Upper GI series – SBO obstruction



Ileo-ileal intussusception



Intussusception “spearheaded” by peduculated tumor

Laparotomy with lysis of adhesions for intestinal obstruction

Mechanical intraluminal obstruction
Parasites within the small bowel

Laparoscopic lysis of adhesions for small intestine obstruction

Laparoscopic management of SBO induced by post appendectomy adhesions.

TREATMENT OPTIONS FOR COLON OBSTRUCTION

Colon obstruction represents a common surgical emergency. In the best majority of cases colon obstruction is a complication of colon carcinoma (80%), although benign pathology can be incriminated (sigmoid volvulus or diverticulitis).

Zorcolo L. et al. Colorectal Dis. 2003;5(3):262-9.

According to the literature data 15-35% patients with colon carcinoma present initially with clinical signs of intestinal obstruction and commonly the obstruction site is located distally to the splenic flexure.

Mella J. et al. Br J Surg. 1997;84(12):1731-6.
Carraro PG. et al. Dis Colon Rectum. 2001;44(2):243-50.

Emergency surgery for left sided colon obstruction is associated with significant morbidity and mortality rates, thus the best majority of patients will undergo a permanent or temporary stoma.

Tekkis PP. et al. Ann Surg. 2004;240(1):76-81.
Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.

Up to date the standard treatment option for right colon obstruction is resection with primary anastomosis (RPA) except the “compromised” cases, unlike in case of left sided colon obstruction.

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.
Breitenstein S. et al. Br J Surg. 2007;94(12):1451-60.

Several treatment options are available up to date for the management of left sided colon obstruction:

1) Staged procedures,
2) Double barrel decompression stoma,
3) Resection and primary anastomosis,
4) Primary anastomosis combined with protective stoma – (Side To End Colostomy STEC procedure),
5) Definitive or temporary endoscopic stenting

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.
Breitenstein S. et al. Br J Surg. 2007;94(12):1451-60.
Siddiqui A. et al. Aliment Pharmacol Ther. 2007;26(10):1379-86.
Помазкин В.И. и соав. Хирургия (Моск). 2008;(9):15-8.
Meijer WS. et al. Tech Coloproctol. 2009;13(2):123-6.
Fukami Y. et al. Surg Today. 2009;39(3):265-8.

Henri Hartmann
1860-1952

Traditionally left sided colon obstruction was managed using staged procedures (ex. Hartmann's procedure – described by Henri Hartmann in 1923), due to potential high complication rate.

Hartmann H. Bull Mem Soc Chir Paris. 1923;30:1474-1477.
Doran H. et al. Chirurgia (Bucur). 2008;103(4):413-6.
Uludag M. et al. Langenbecks Arch Surg. 2010;395(5):535-43.

Simple colostomy is a type of staged procedure for colon obstruction without tumor resection. Within 2 weeks the second step is performed – tumor resection and anastomosis, the last could be performed in a third stage.

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.
Помазкин В.И. и соав. Хирургия (Моск). 2008;(9):15-8.

Advantages of decompressive colostomy:
1) intestinal decompression
2) minimal surgical trauma
3) minimal contamination risk

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.
Помазкин В.И. и соав. Хирургия (Моск). 2008;(9):15-8.

Up to date there's just one randomized clinical trial to compare decompressive colostomy with RPA, and only a significantly higher hospital stay was demonstrated for colostomy group without differences in morbidity and mortality rates in both groups.

Kronborg O. Int J Colorectal Dis. 1995;10(1):1-5.

Thus tumor resection is considered the standard treatment option for patients with malignant colon obstruction, but the modality of finalizing the surgical procedure is controversial, two options being available:

1) Colostomy (Hartmann's procedure)

2) Primary anastomosis

Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.

Resection with colostomy is considered a safe procedure due to the absence of potential suture leakage and this type of surgery can be performed by all surgeons.

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.

Reconstruction of the intestinal continuity is performed 7-9 month after primary surgery and about 50-60% of the patients will never have their somas reversed.

Помазкин В.И. и соав. Хирургия (Моск). 2008;(9):15-8.
Leong QM. et al. Tech Coloproctol. 2008;12(1):21-5.
Turan M. et al. Surg Today. 2002;32(11):959-64.

Nowadays the rate of staged surgical procedures for colon obstruction is less frequent due to significant hospital stay as well as for the need of repeated surgery.

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.

According to the literature data postoperative death rate for staged procedures varies between 19 and 33%.

Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.
Leong QM. et al. Tech Coloproctol. 2008;12(1):21-5.

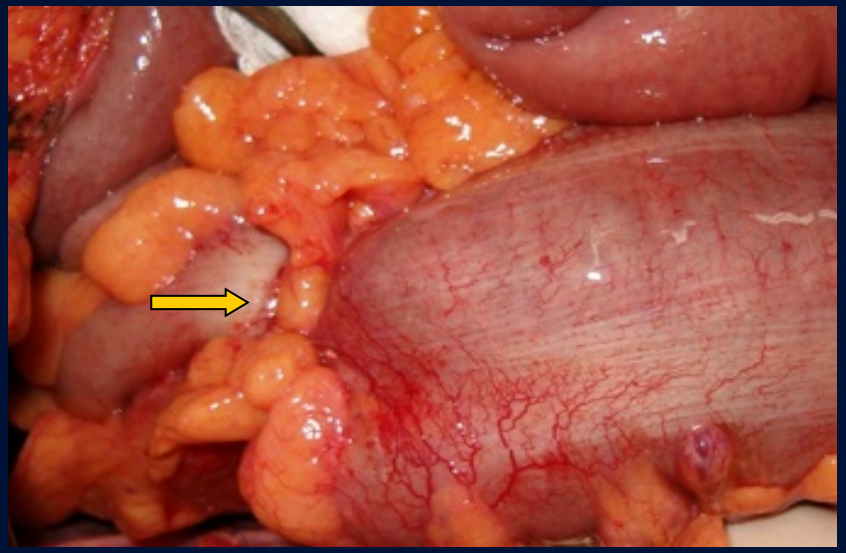
	Mortality	Morbidity
Stoma patients	**38.77%**	**32.64%**

Thus the cumulative morbidity and mortality rate for staged procedures is as high and that is an argument in favor of aggressive surgical management.

Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.

Recently were published data regarding RPA following intraoperative colon lavage for decompression of the obstruction.

Zorcolo L. et al. Colorectal Dis. 2003;5(3):262-9.
Carraro PG. et al. Dis Colon Rectum. 2001;44(2):243-50.
Turan M. et al. Surg Today. 2002;32(11):959-64.



The advantages of single stage surgical procedures are:
1) definitive surgery
2) low hospital stay
3) reduced morbidity and mortality
4) no stoma

Zorcolo L. et al. Colorectal Dis. 2003;5(3):262-9.
Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.
Turan M. et al. Surg Today. 2002;32(11):959-64.

Although postoperative results were recently improved, emergency surgery for colon obstruction is associated with significant morbidity and mortality compared to elective procedures.

Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.
Turan M. et al. Surg Today. 2002;32(11):959-64.
Hsu T.C. Dis Colon Rectum. 1998;41(1):28-32.
Narayansingh V. et al. Br J Surg. 1999;86(10):1341-3.

	Mortality	Morbidity
Resection and primary anastomosis	**16.43%**	**30.1%**

Disadvantages of the single step procedures:
1) Experienced surgeon
2) Potential suture leakage

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.

Up to date there are no published randomized trials to compare the outcomes of staged and single step procedures, but the nonrandomized studies failed to prove advantages of the Hartmann's procedure over RPA regarding the mortality rates.

Zorcolo L. et al. Colorectal Dis. 2003;5(3):262-9.
Tekkis PP. et al. Ann Surg. 2004;240(1):76-81.
Meyer F. et al. Tech Coloproctol. 2004;8 Suppl 1:s226-9.
Villar JM. et al. Surg Today. 2005;35(4):275-81.
Biondo S. et al. Dis Colon Rectum. 2004;47(11):1889-97.

The suture leakage rate in case of RPA for malignant colonic obstruction reaches 30.7%.

Alcántara M. et al . World J Surg. 2011;35(8):1904-10.

	Suture leakage	Mortality (suture leakage)
RPA	13.7%	4.41% (n=3)

Recent advances in operative techniques as well as postoperative management reduced the suture leakage rate to 17%.

Hsu T.C. Dis Colon Rectum. 1998;41(1):28-32.
Narayansingh V. et al. Br J Surg. 1999;86(10):1341-3.

Although RPA is considered the preferred method of treatment for selected patients with malignant colonic obstruction, the volume of resection is controversial, thus total or subtotal colonectomy are available.

Hennekinne-Mucci S. et. al. Int J Colorectal Dis. 2006;21(6):538-41.

This procedure avoids the dilemma of the “unprepared colon” as well as reduces the risk of potential tumors of the right colon.

Trompetas V. Ann R Coll Surg Engl. 2008;90(3):181-6.

This type of surgery is associated with significant trauma as well as postoperative diarrhea.

Hennekinne-Mucci S. et. al. Int J Colorectal Dis. 2006;21(6):538-41.

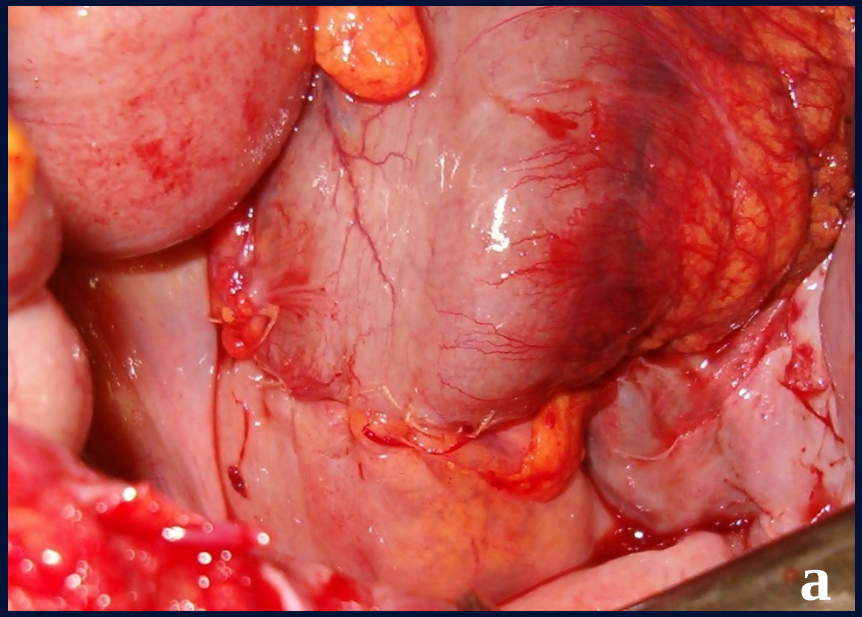
Thus in the 1980 a new approach was introduced – RPA after intraoperative colonic lavage as alternative for total colonectomy.

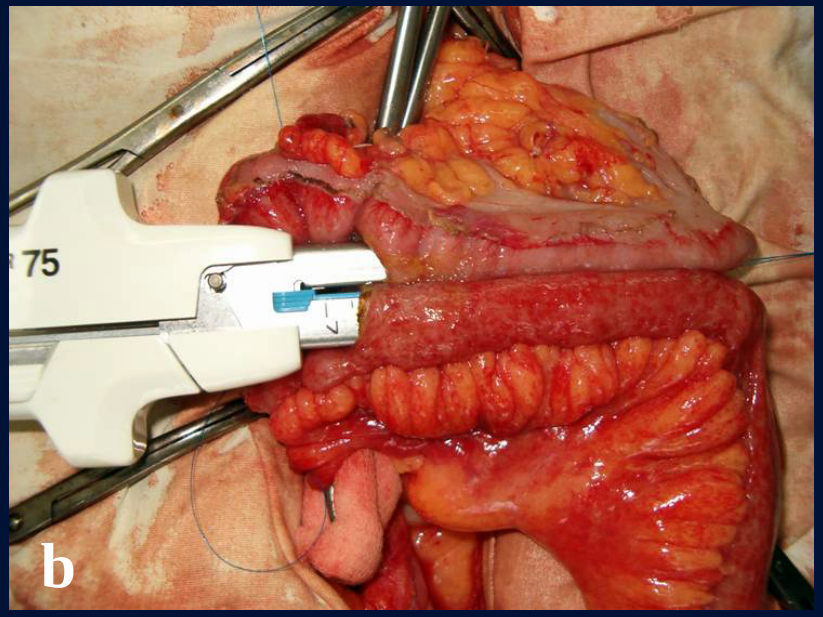
The SCOTIA Study Group. Br J Surg. 1995;82(12):1622-7.

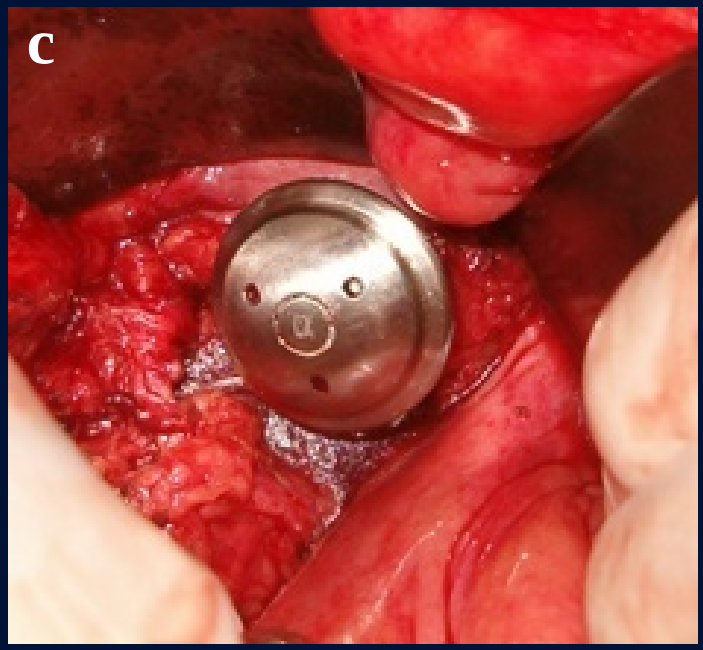
Intraoperative image – colon decompression , "on table" retrograde lavage

Intraoperative image – colon decompression , "on table" anterograde lavage

This type of surgery combines the advantages of a prepared colon as well as excluding postoperative diarrhea.







a – Hand applied left sided primary anastomosis.

b – Side-to-side functional end-to-end anastomosis (ileum and transverse colon)

c – Stapled anastomosis on the left colon

Disadvantages of this type of surgery are: significant operative time (over 60 min), wound sepsis risk as well as the need of an experienced surgeon.

The SCOTIA Study Group. Br J Surg. 1995;82(12):1622-7.

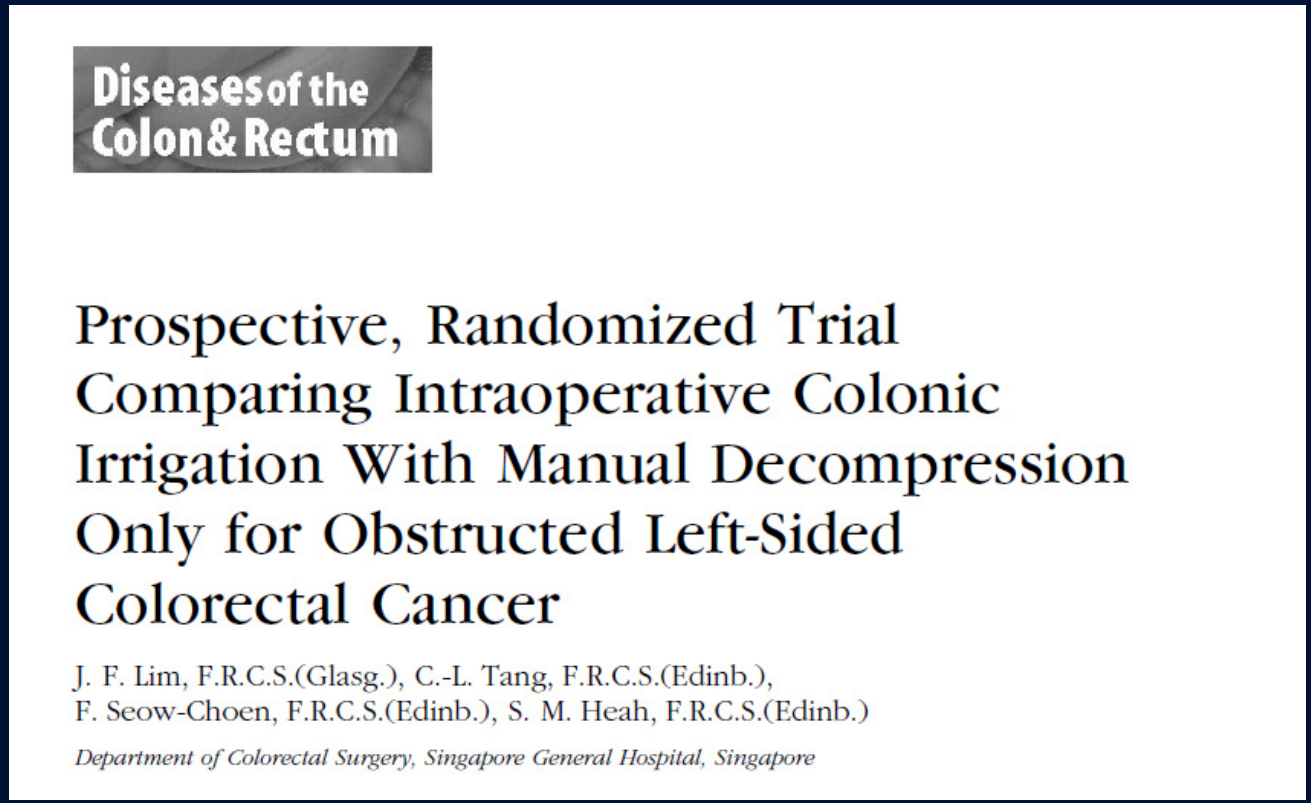
Up to date there are data published regarding RPA without on-table colonic lavage, instead the use of manual decompression being advocated.

Turan M. et al. Surg Today. 2002;32(11):959-64.
Patriti A. et al. Colorectal Dis. 2005;7(4):332-8.
Lim JF. et al. Dis Colon Rectum. 2005;48(2):205-9.

	MD mean (limits)	CL mean (limits)	Significance
Time of surgery	120 (55–250) min.	145 (60–215) min	0.3
Time of MD and CL	15 (5–30) min.	30 (10–55) min.	<0.0005
Time of obstruction	3 (1–9) days	3 (2–6) days	0.8
Hospitalization	10 (2–24) days	8.5 (5–36) days	0.3
Wound sepsis	4/25	3/24	0.7
Suture leakage	2/25	0/24	0.5

MD – manual decompression; CL – colon lavage

Lim JF. et al. Dis Colon Rectum. 2005;48(2):205-9.



This studies failed to prove the advantages of colonic lavage over manual decompression regarding the specific postoperative complication – suture leakage, still manual decompression reduces significantly the operative time.

Lim JF. et al. Dis Colon Rectum. 2005;48(2):205-9.
Cross KL. et al. Ann R Coll Surg Engl. 2008;90(4):302-4.

Similar results were obtained in our surgical department.

	Colon lavage	Manual decompression	Significance
Suture leakage	**15%**	**14.58%**	**NS**

Still we advocate the intraoperative anterograde colonic lavage for colonic decompression at least for the surgeon’s comfort.

Although RPA up to date is considered benefic as to Hartmann's procedure, this statement is not suitable for all patients with left-sided colon obstruction, some other parameters being important in the decision making process: age, ASA score, type of surgery (urgent/elective) as well as the tumor stage.

Tekkis PP. et al. Ann Surg. 2004;240(1):76-81.

Thus the type of surgery must be selected upon the patient's general condition, surgeon's experience, sometimes Harmann's procedure being more appropriate for high risk patients.

Int J Colorectal Dis
DOI 10.1007/s00384-010-1123-2

ORIGINAL ARTICLE

Diversion stoma after colorectal surgery: loop colostomy or ileostomy?

Christian D. Klink · Kosta Lioupis · Marcel Binnebösel · Daniel Kaemmer · Ivanna Kozubek · Jochen Grommes · Ulf P. Neumann · Marc Jansen · Stefan Willis

Diversion stoma is advocated by some authors in order to reduce suture leakage.

Law WI. et al. Am J Surg. 2000;179(2):92-6.
Moran B. et al. Semin Surg Oncol. 2000 ;18(3):244-8.

Most frequently used are:
1) Barrel iliostomy
2) Barrel transversostomy

Klink CD. et al. Int J Colorectal Dis. 2011 Jan 11. [Epub ahead of print].
Gastinger I. et. al. Br J Surg. 2005 Sep;92(9):1137-42.

Barrel transversostomy advantages:

1) Easy surgical technique
2) Reduced morbidity

Sakai Y. et al. Arch Surg. 2001 Mar;136(3):338-42.
Rutegård J. et al. Acta Chir Scand. 1987;153(3):229-32.

Barrel transversostomy disadvantages:

1) Care difficulties due to positioning
2) Poor life quality comparative to a barrel ileostomy

Sakai Y. et al. Arch Surg. 2001 Mar;136(3):338-42.
Rutegård J. et al. Acta Chir Scand. 1987;153(3):229-32.

Barrel ileostomy – advantages (ileostomy *vs.* transversostomy):

1) Recovery of intestinal function (2±1 *vs.* 4±2 $p<0.001$) days
2) Elevated quality of life compared to barrel transversostomy

Klink CD. et al. Int J Colorectal Dis. 2011 Jan 11. [Epub ahead of print].

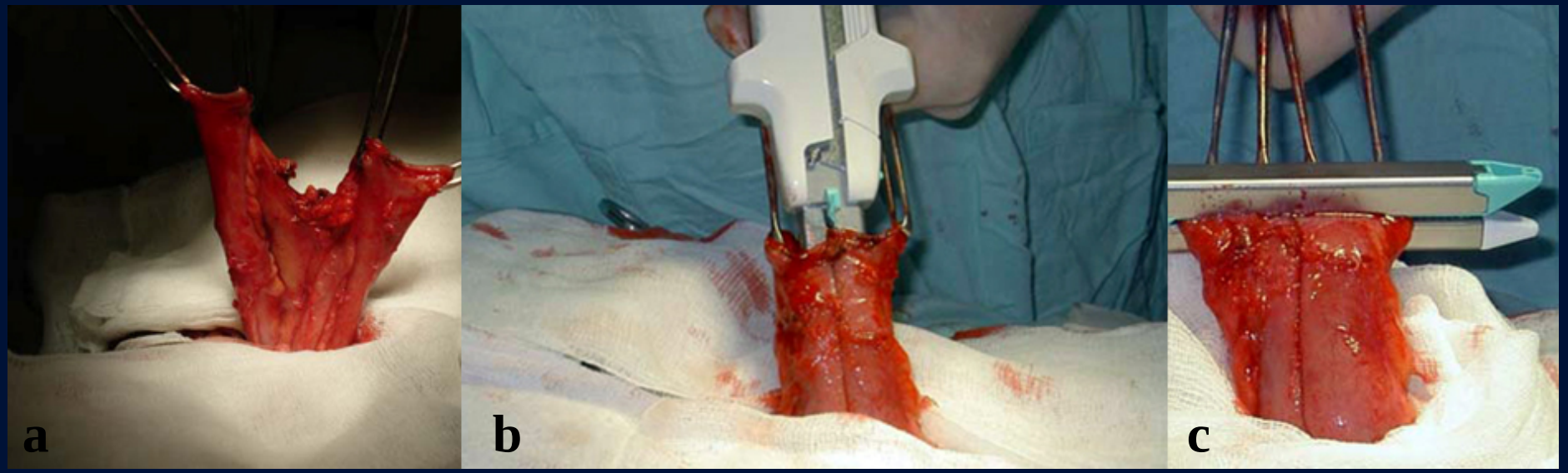
Barrel ileostomy – disadvantages (ileostomy *vs.* transversostomy):

1) Parastomal dermatitis (15% *vs.* 0% $p<0.001$)
2) Renal failure (10% *vs.* 1% $p=0.005$)
3) Hypokaliemia (16% *vs.* 1% $p<0.001$)
4) Hypokalcemia (28% *vs.* 5% $p<0.001$)

Klink CD. et al. Int J Colorectal Dis. 2011 Jan 11. [Epub ahead of print].

Stoma closure for transversostomy *vs.* ileostomy was performed at 124±69 *vs.* 147±77 (p=0.522) POD respectively through parastomal approach.

Klink CD. et al. Int J Colorectal Dis. 2011 Jan 11. [Epub ahead of print].

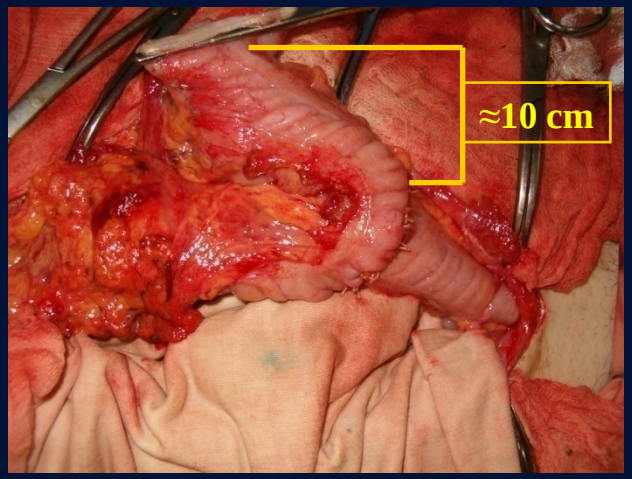


Barrel iliostomy closure – steps of surgery:
a) Mobilization and stoma resection;
b) Side to side functionally end-to-end stapled anastomosis
c) Final view of the stapled anastomosis

Shelygin YA. et al. Tech Coloproctol. 2010;14(1):19-23.

Recently a new surgical procedure for the management of malignant left-sided colon obstruction was published – the Side-To-End-Colostomy (STEC procedure).

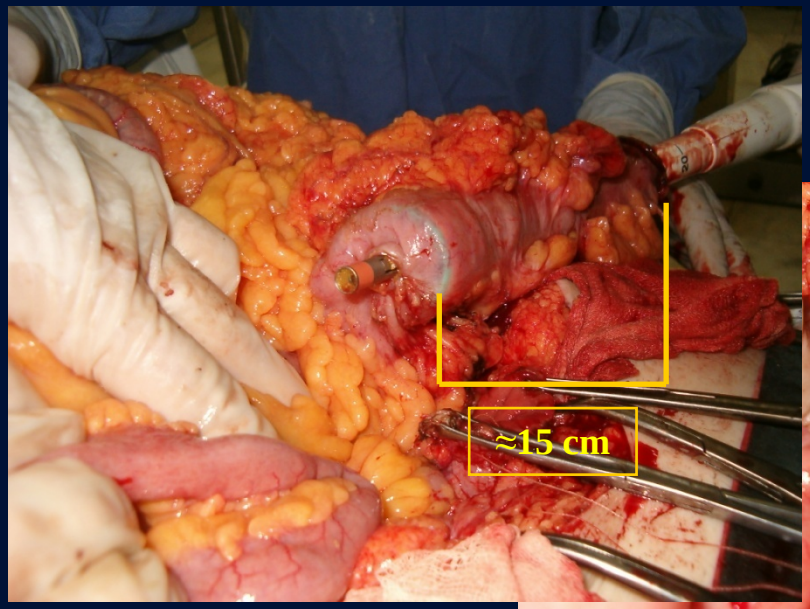
Safioleas MC. Et al. Int J Colorectal Dis. 2006;21(2):186-7.
Meijer WS. et al. Tech Coloproctol. 2009;13(2):123-6.
Fukami Y. et al. Surg Today. 2009;39(3):265-8.

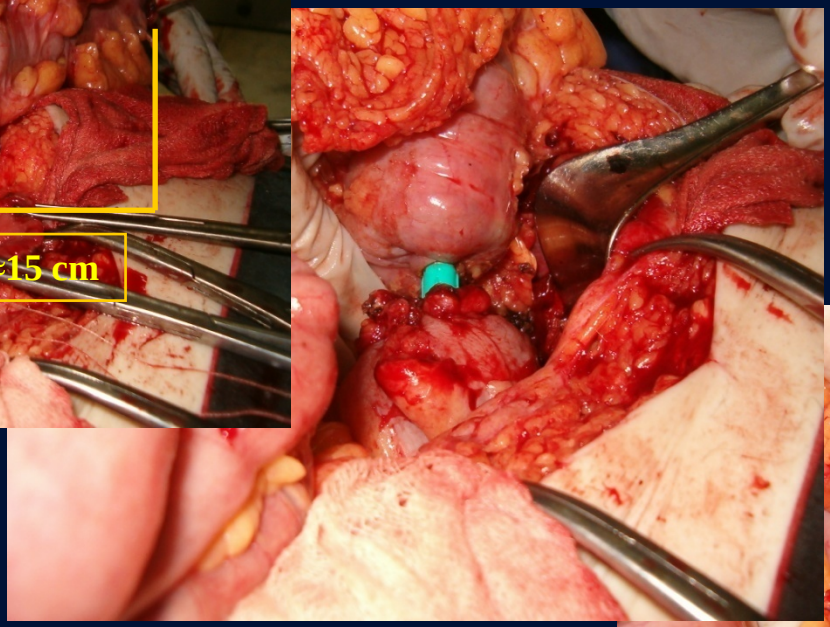


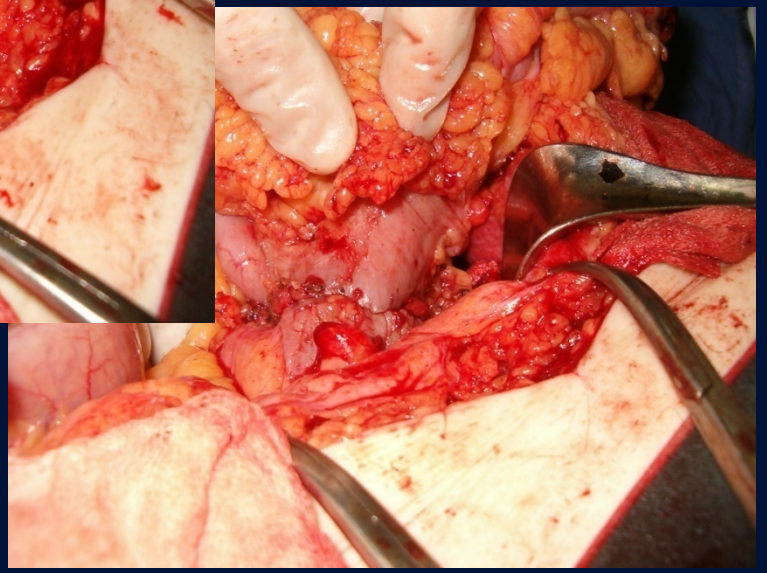
This method combines the advantages of the primary anastomosis and decompressive colostomy

Stapled side to end colostomy with a PREMIUM PLUS CEEA™ device Ø 31 mm.

The left colon was mobilisied in the standard manner with en block resection of the IMA.

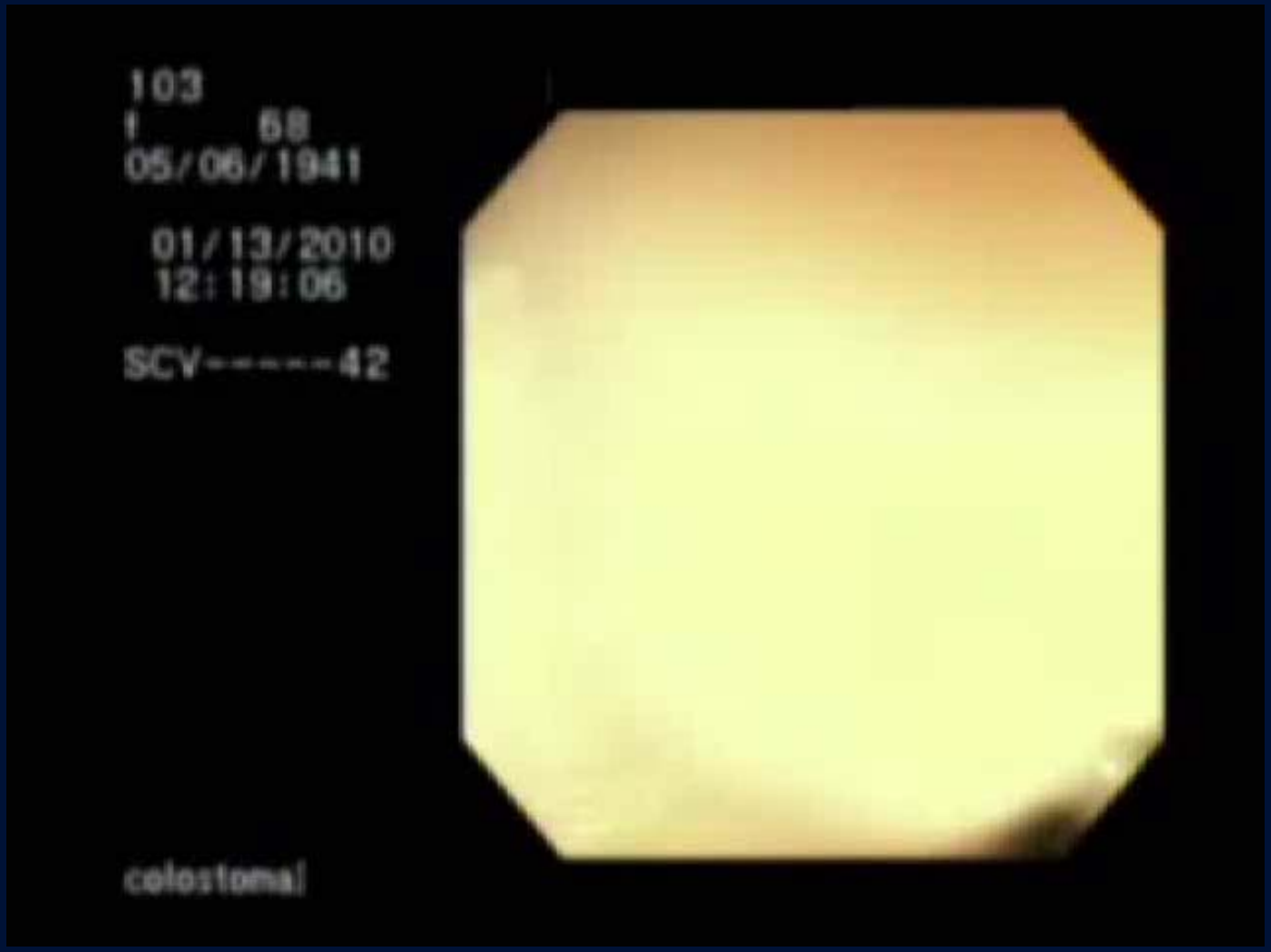




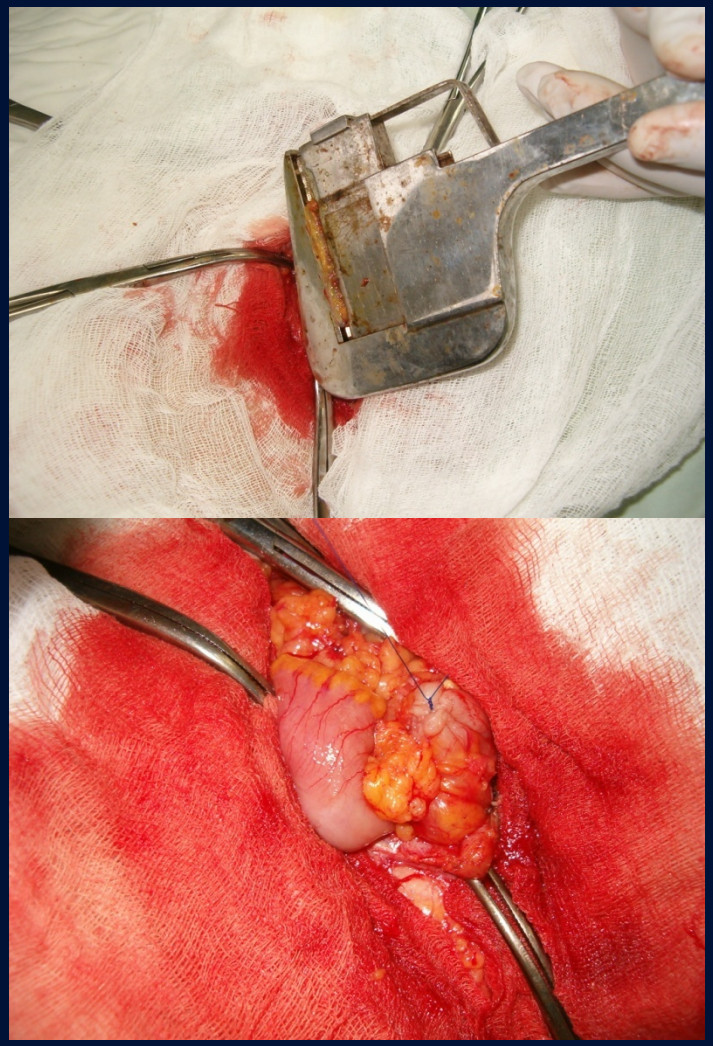


The stapler is introduced through the proximal colon to form a side-to-end anastomosis at ≈ 15 cm from the decompressive colostomy.

Preoperative colonoscopy is mandatory in order to diagnose early tumor recurrence; suture leakage and synchronous tumors.



Unlike for the Hartmann’s procedure stoma reversal does not require middle laparotomy, can be done with local anesthesia and within reduced postoperative time.

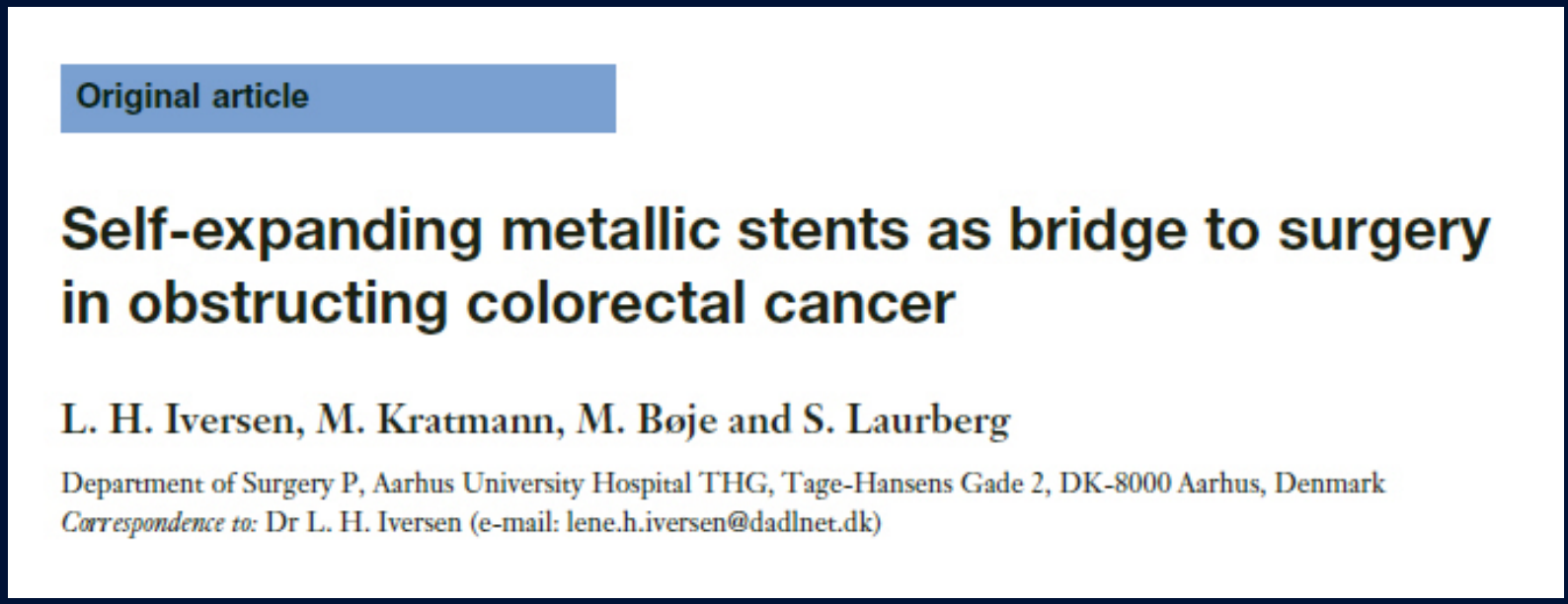


Stoma closure was done for 12/13 (92.3%) patients within 44.58 ± 4.43 (20 to 72) POD by parastomal approach.

Another important advantage of this procedure (STEC) is the absence of diameter size between the distal and proximal colon.

Fukami Y. et al. Surg Today. 2009;39(3):265-8.

Due to limited experience with this procedure additional studies are necessary in order to find out the optimal distance between the colostomy and anastomosis, as well as the optimal time for stoma closure.



Original article

Self-expanding metallic stents as bridge to surgery in obstructing colorectal cancer

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A new treatment option for colon malignant obstruction is the endoscopic stenting – described in the 90. The method is used for:

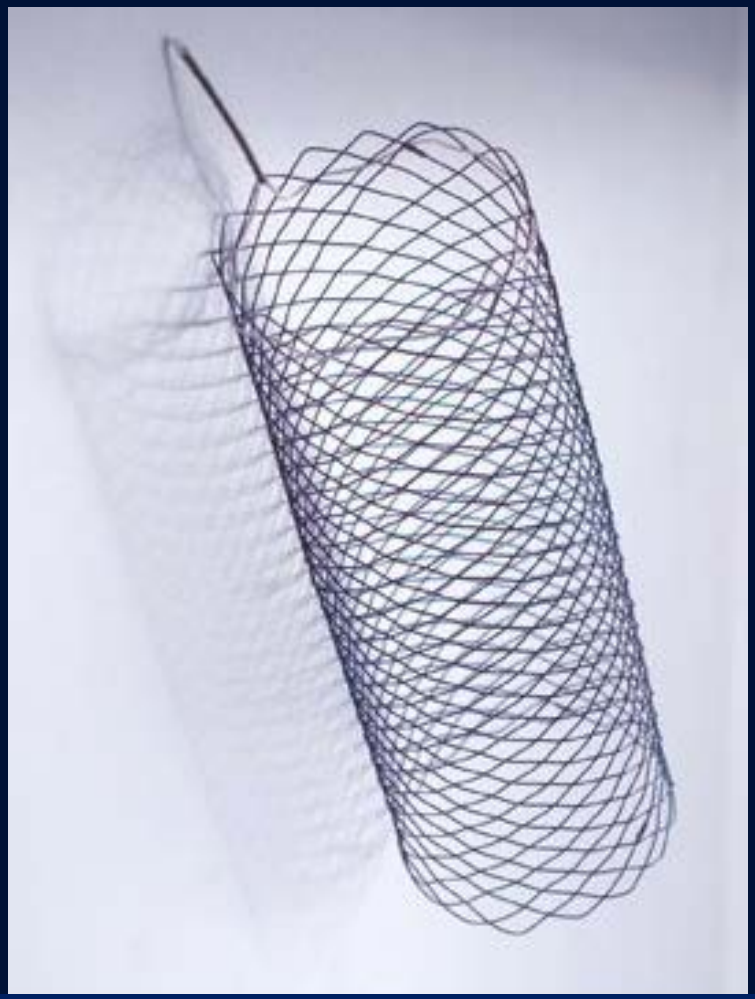
1) Palliation of inoperable patients.

2) Preoperative decompression.

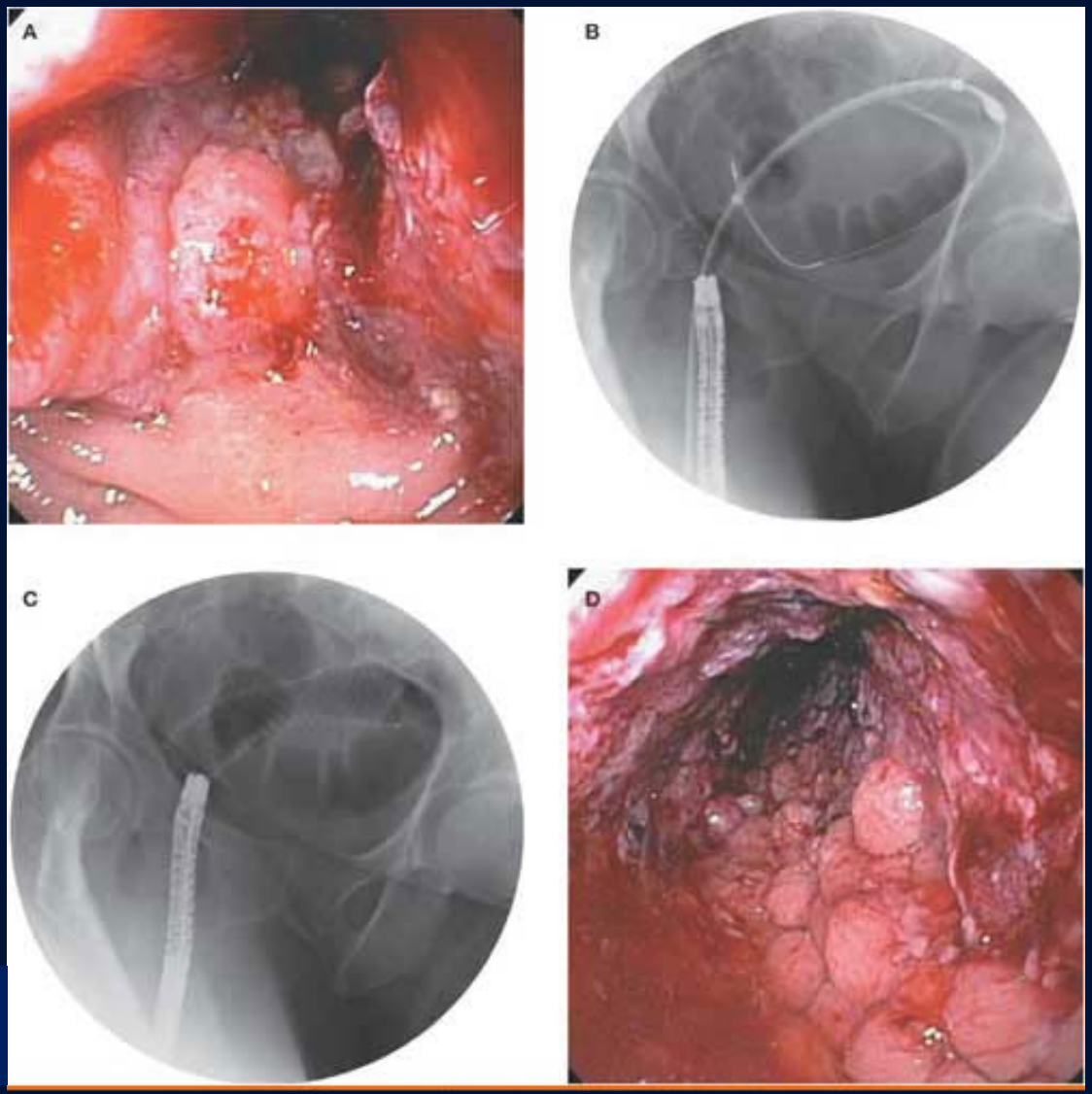
Harris GJ. et al. Am J Surg. 2001;181(6):499-506.
Iversen LH. et al. Br J Surg. 2011;98(2):275-81.

The success rate for endoscopic stenting of the malignant colonic obstruction reaches 90-100%.

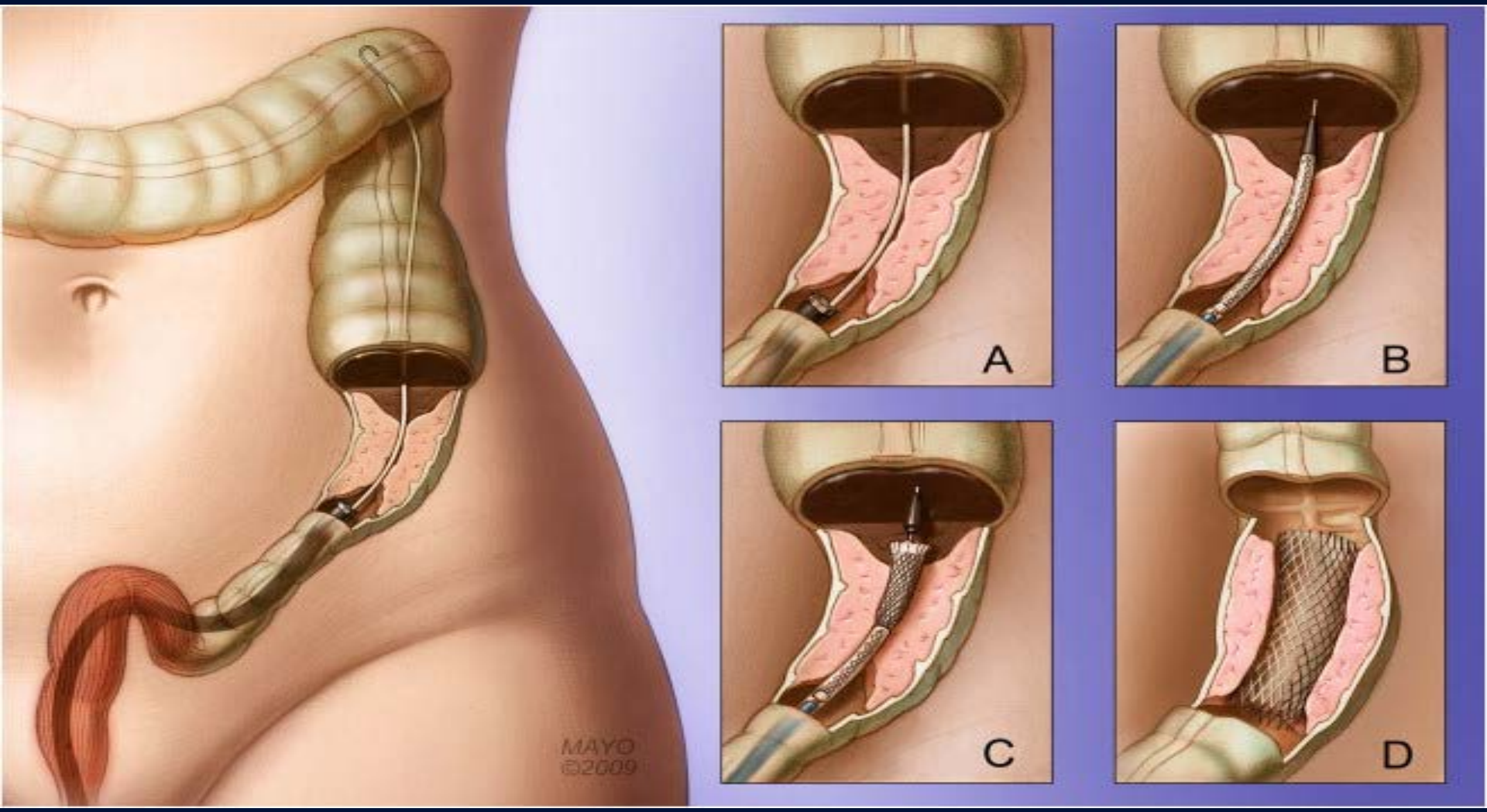
Sebastian S. et al. Am J Gastroenterol. 2004;99(10):2051-7.



(SX-ELLA Stent Colorectal - ENTERELLA®)

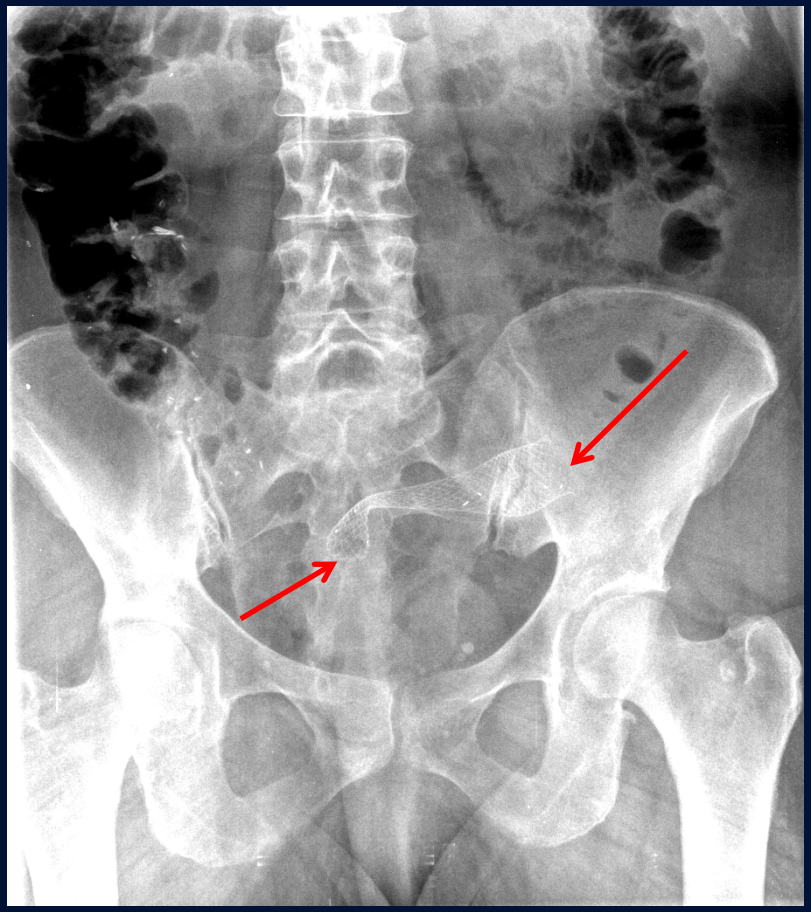


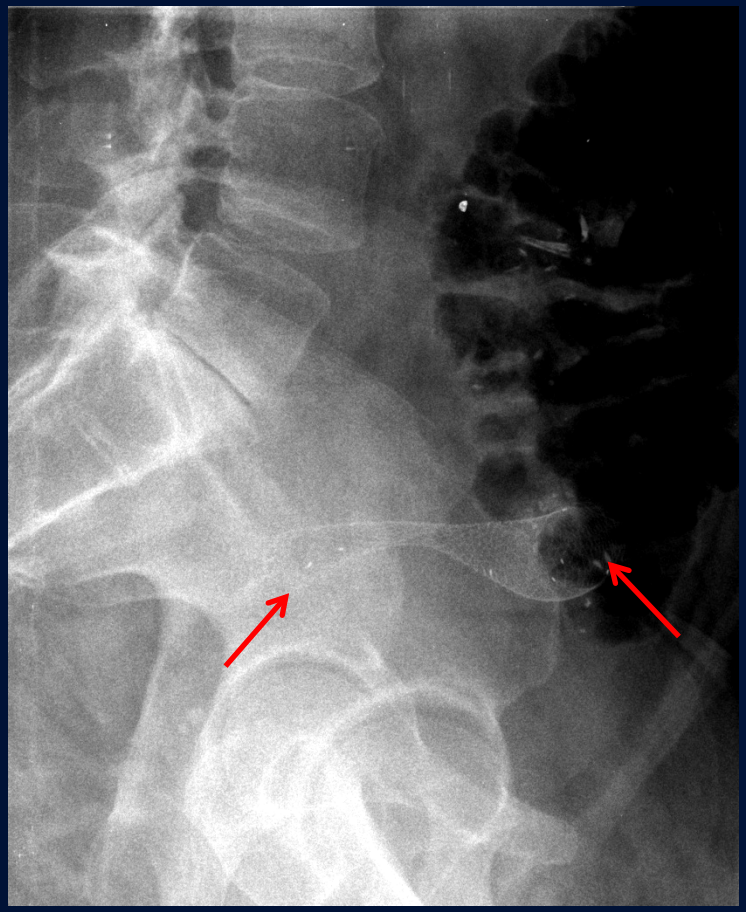
(A) Endoscopic view of malignant rectosigmoid obstruction. (B) Fluoroscopic image during stent deployment. (C) The expanded self-expanding metal stent (Ultraflex Precision Colonic Stent System, Boston Scientific/Microvasive, Natick, MA) traverses the stricture. (D) Improved luminal patency after stent deployment.


A
B
C
D
MAYO
©2009

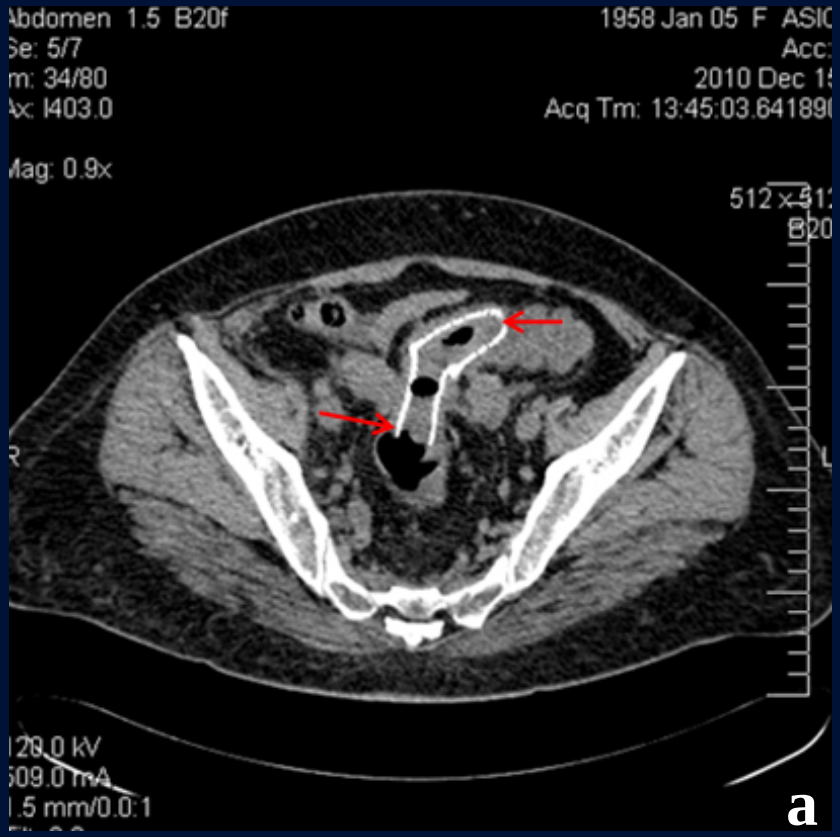
Endoscopic stenting is possible only for left-sided colonic obstruction, especially for the obstructions localized in the recto-sigmoid region.

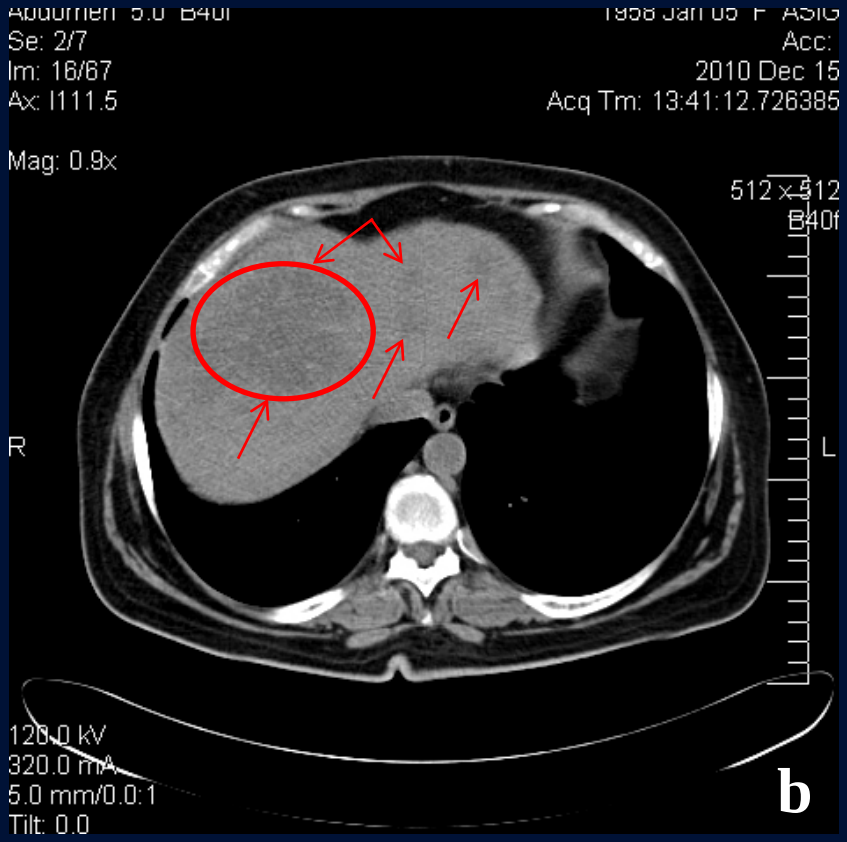
Sebastian S. et al. Am J Gastroenterol. 2004;99(10):2051-7.





Stent *in situ* recto-sigmoid region affected by obstructive carcinoma 24 hours after stenting (SX-ELLA Stent Colorectal - ENTERELLA®)





Stent *in situ* (a) recto-sigmoid region affected by obstructive carcinoma 60 days after stenting; Multiple liver Mt (b) – the same patient.

"Successful stenting signs"

Method related complications are:
1) perforation – 3.7%
2) stent migration – 12%
3) stent obstruction – 7%

Harris GJ. et al. Am J Surg. 2001;181(6):499-506.
Sebastian S. et al. Am J Gastroenterol. 2004;99(10):2051-7.
Khot UP. et al. Br J Surg. 2002;89(9):1096-102.

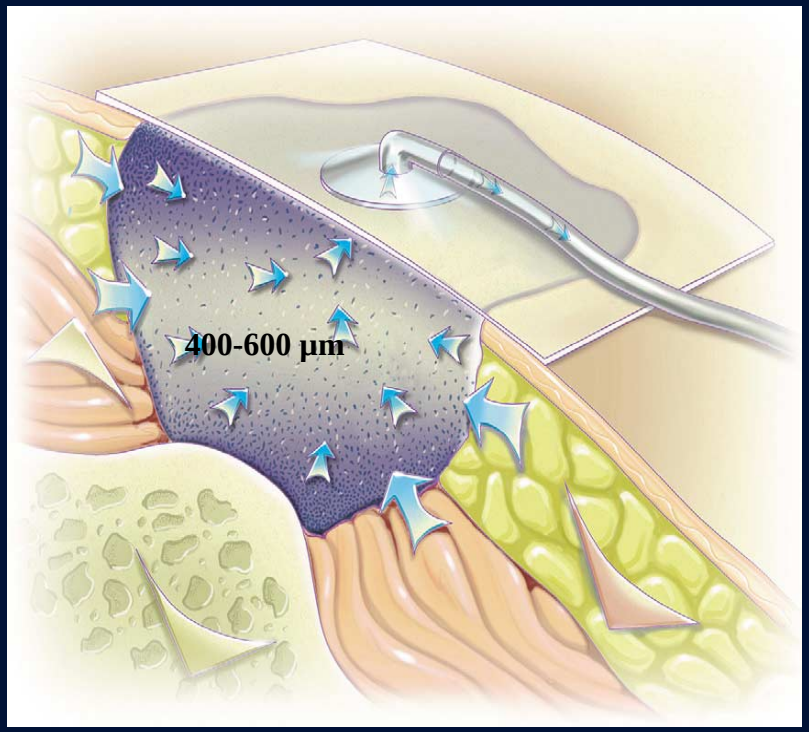
Endoscopic stenting is associated with a reduced complication rate, reduced hospital stay as well as a reduced stoma rate.

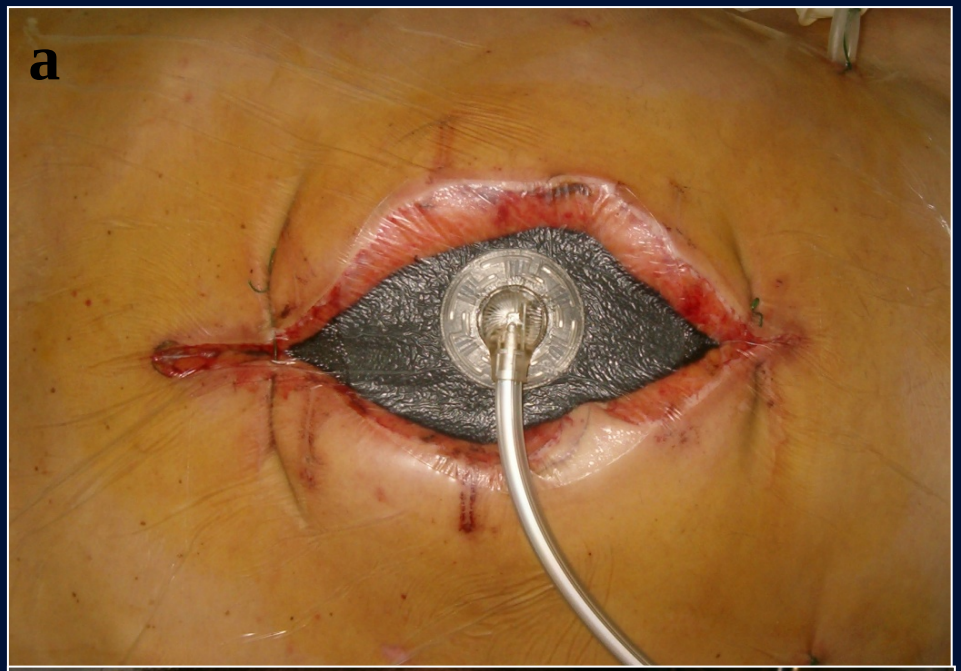
Martinez-Santos C. et. al. Dis Colon Rectum. 2002;45(3):401-6.
Tilney HS. et. al. Surg Endosc. 2007;21(2):225-33.

Thus endoscopic stenting is a safe method with a significant success rate and a good quality of life by avoiding stoma.

Xinopoulos D. et al. Surg Endosc. 2004;18(3):421-6.
Fiori E. et al. Anticancer Res. 2004;24(1):265-8.

Unfortunately the cost/benefit ratio of the method is an important issue, stents being expensive up to date, but this disadvantage could be compensated by a reduced hospital rate.





(a) Final view – standard VAC for diffuse secondary peritonitis due to suture leakage.

(b) Final view – home made vacuum closure for diffuse secondary peritonitis due to suture leakage.


QUESTIONS?