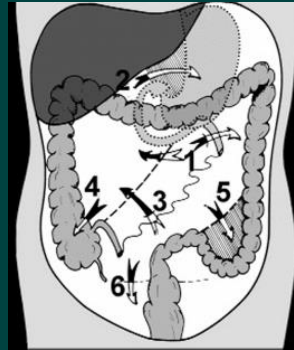


Internal Hernias

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This is a summary of the most common (but still rare!) internal hernias, adapted from the article in AJR entitled *Review of Internal Hernias: Radiographic and Clinical Findings*.

Read More: <https://www.ajronline.org/doi/10.2214/AJR.05.0644>

References also available at the end for further resources.

Objectives

- Assess for the signs of strangulation and bowel obstruction.
- Remember normal anatomy and recognize signs of internal hernia.
- Identify the vascular pedicle and track it to the orifice.
- Use anatomic landmarks to categorize the internal hernia type.

Jump to:

Paraduodenal- slide 9

Pericecal – slide 20

Foramen of Winslow- slide 22

Transmesenteric- slide 25

Pelvic- slide 27

Sigmoid- slide 31

Transomental- slide 34

Post-gastric bypass- slide 36

Common Complications

- Incarceration
 - Irreducible hernia
- Strangulation
 - Ischemia from a compromised blood supply
- Bowel Obstruction
 - Hernias are the 2nd leading cause after adhesions (10-15%)

Incarceration

- Clinical diagnosis
- More likely with a small defect
- Contents matter

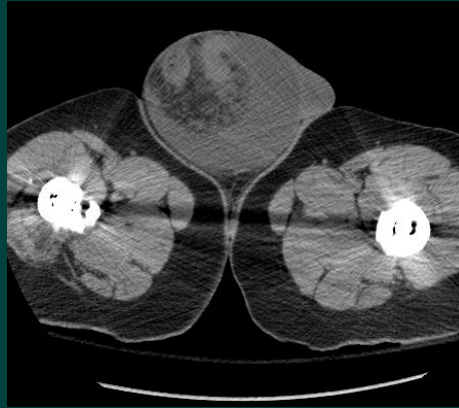


Small bowel through a small defect is more dangerous than simply fat.

There are no signs of strangulation in the sagittal CT above. Note the loop of small bowel through the tiny ventral wall defect.

Strangulation

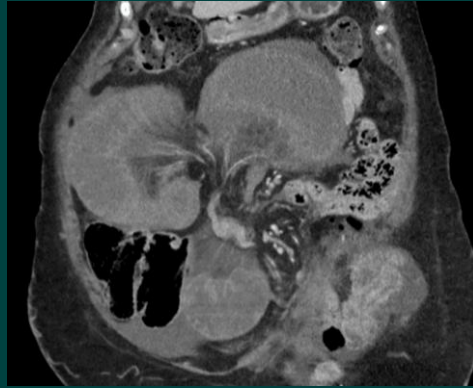
- Wall thickening
- Abnormal enhancement
- Vessel engorgement
- Fat stranding
- Ascites within hernia sac
- Luminal dilation



Right inguinal hernia with all the signs mentioned above (slice above would show the dilated bowel better).

Bowel Obstruction

- Transition point at level of hernia
- Dilated proximal bowel
 - (+/- fecalization)
- Normal/reduced caliber bowel distally
- Closed vs open



Internal hernias are closed loop (what goes into the hernia sac must come out). Closed have a greater risk of perforation because both ends are closed off and contents have nowhere to go.

Remember, when you call an obstructed internal hernia, the surgeons will be more likely to take the patient to the OR because of the risk with closed loop obstructions.

Internal Hernias, Specifically

- Responsible for 4% of bowel obstructions.
- Part of the search pattern on a CT, especially for “?obstruction”.
- Key to correct classification:
 - Dilated fluid-filled cluster of bowel loops
 - Vascular pedicle
 - Orifice
 - Anatomic landmarks

Add it to your search pattern for the bowel.

Look for **clustered** loops that appear out of place. Just like with any other type of hernia, it could be present and not causing symptoms, or it could be strangulated or obstructed.

Trace the **vascular pedicle** back to the apex to identify the likely position of the hernia **orifice**.

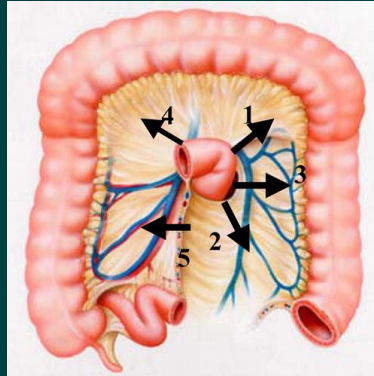
Look for **other anatomic landmarks** to help identify the type of hernia.

1. Paraduodenal
2. Foramen of Winslow
3. Transmesenteric
4. Pericecal
5. Intersigmoid Fossa
6. Pelvic



Mathieu and Luciani

Paraduodenal (53%)



Takeyama et. al.

Congenital: failure of colonic mesentery and parietal peritoneum to fuse. Up to nine types of fusion failure have been described.

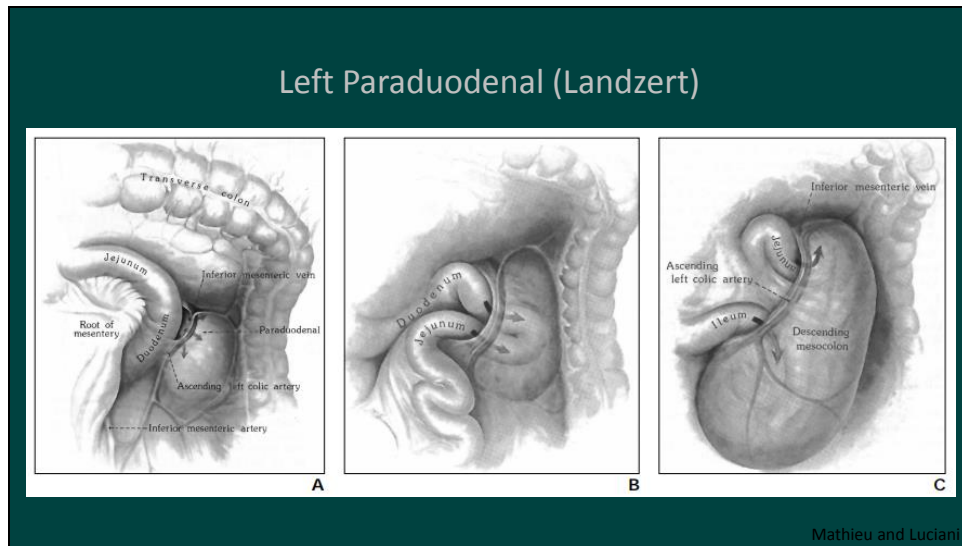
Diagram above:

- 1- superior duodenal fossa
- 2- inferior duodenal fossa (fossa of Trietz)
- 3- paraduodenal fossa (Landzert)
- 4- intermesocolic fossa (Broesike)
- 5- mesentericoparietal fossa (Waldeyer)

Remember that the 3rd and 4th portions of the duodenum are retroperitoneal. It crosses from right to left, wraps around the head of the pancreas, passes over the aorta and under the SMA, and becomes intraperitoneal at the ligament of Treitz (which is the peritoneal reflection).

The colonic mesentery forms a basket that holds the small bowel loops.

The small bowel can spill out of the basket over the rim, but it can't pass below the rim unless there is a hole in the basket (mesentery).



Left paraduodenal: Landzert (75% of paraduodenal hernias).

LUQ failed fusion of **descending** colon mesentery to peritoneum.

Small bowel goes through defect.

Vasculature helps— cluster of loops **behind the IMV or left colic artery** (which are contained in anterior sac wall).

Clustered loops in the left anterior pararenal space, **between stomach and pancreas**, lateral to ligament of Treitz.

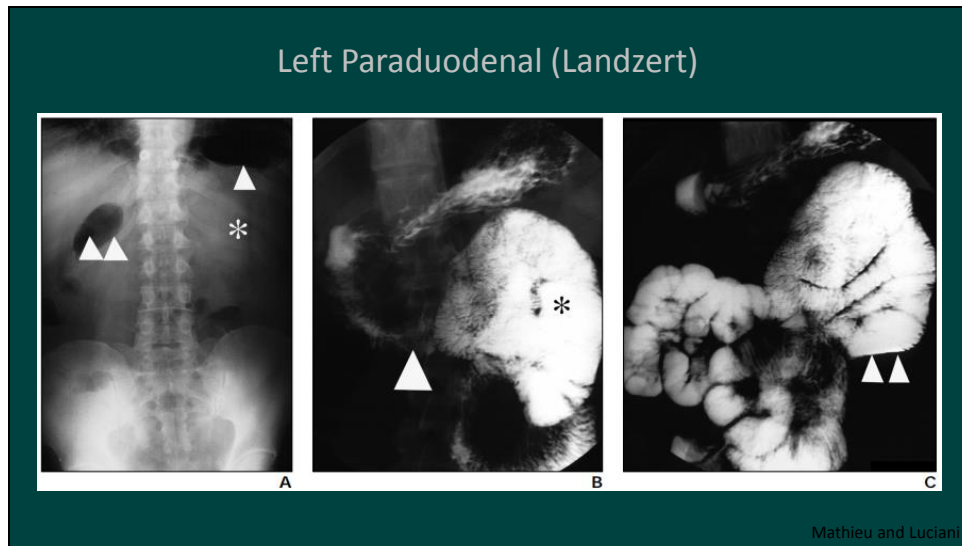


Image1: AXR.

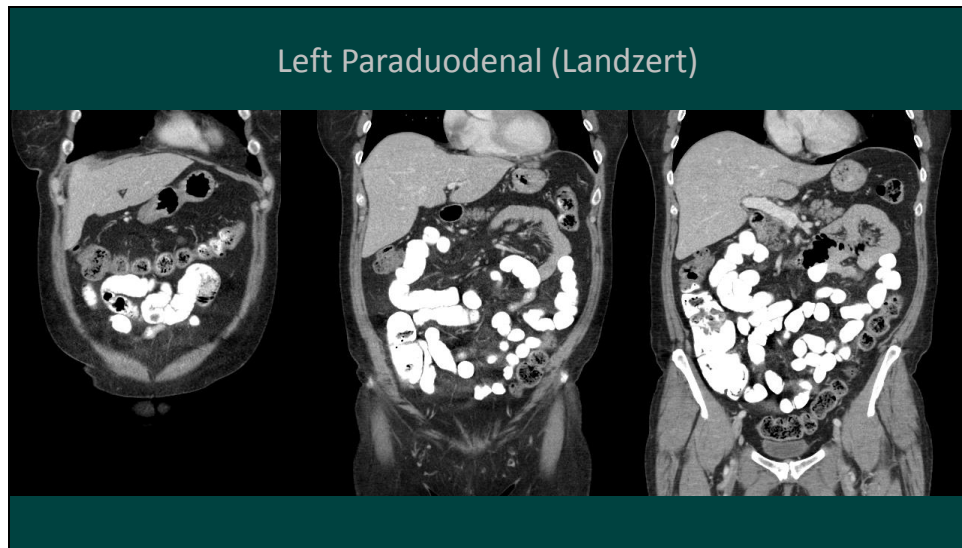
Stomach compressed superior and transverse colon to the right.

Image 2 and 3: SBFT.

Large cluster of small bowel in LUQ.

Immobile on compression.

Delayed emptying of contrast.



Notice the transverse colon position in image 1.

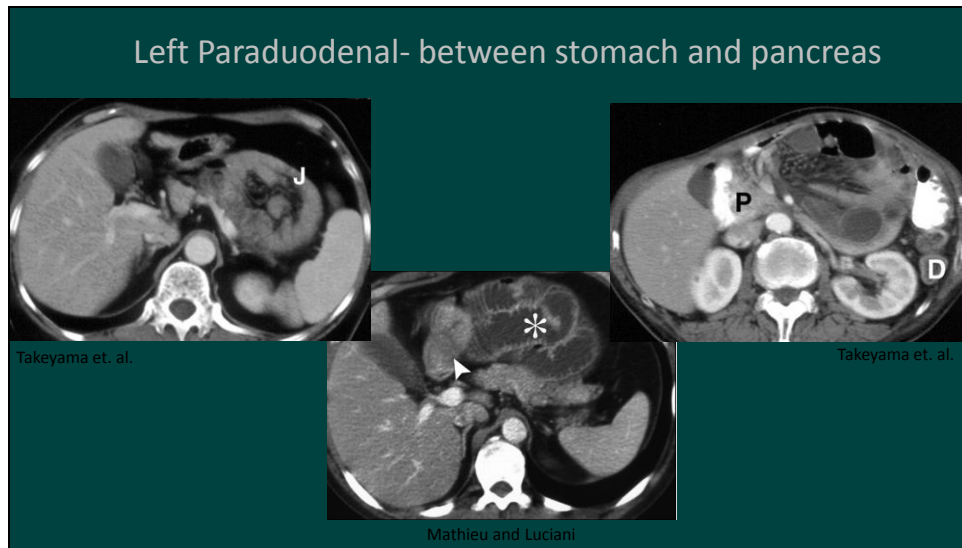
The small bowel on the cuts below (images 2 and 3) is located superior (outside the basket). It has not spilled over the rim, but has somehow found a way to be positioned in the LUQ.....

Slide 13

Left Paraduodenal- between stomach and pancreas

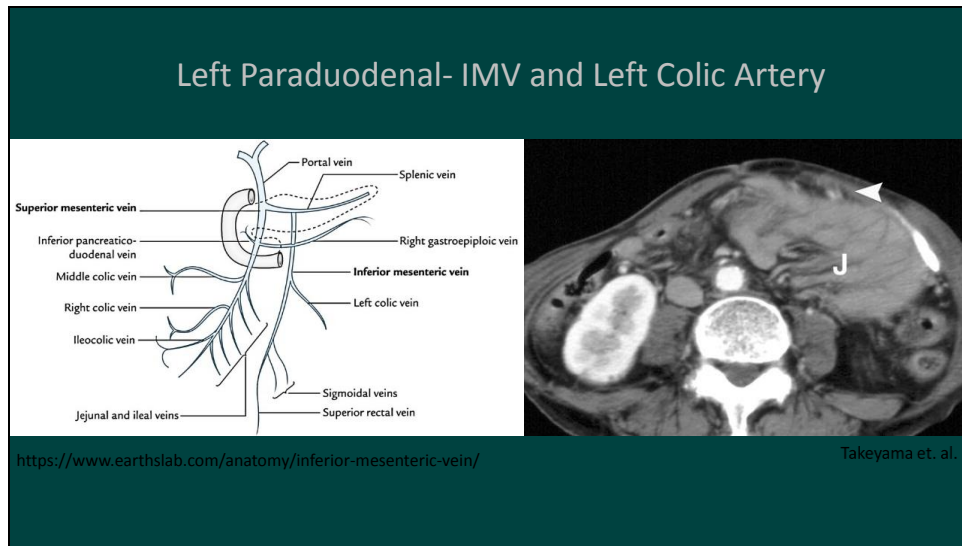


..... And between the pancreas and stomach.



These cases were proven in the OR (from the literature).

Notice in all of them, the cluster of small bowel (J or *) is located between the pancreas and stomach. The duodenum (D) is still located in its normal position.

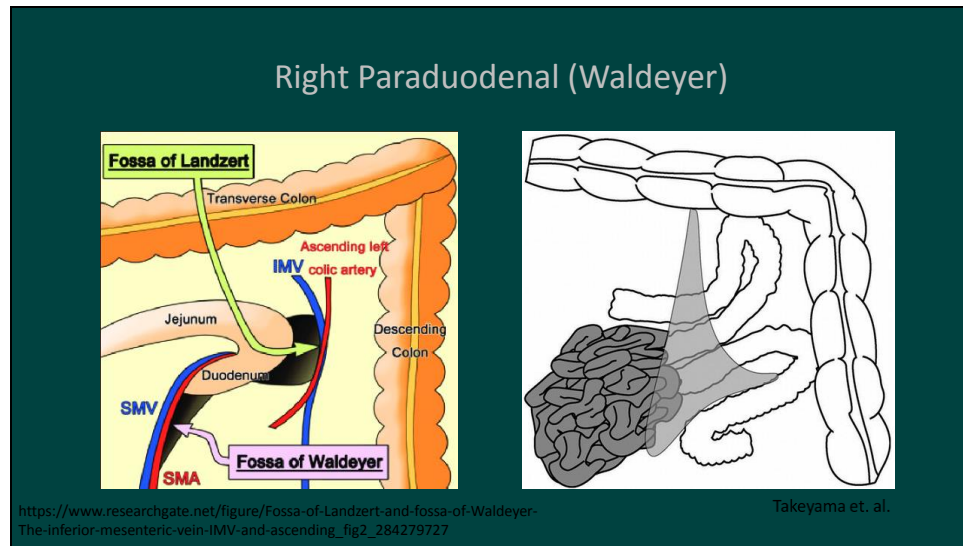


I find the IMV easiest to identify and follow. Use it to confirm the left paraduodenal hernia.

The IMV (joins splenic vein just before the confluence) will be anterior to the clustered small bowel loops.

Or look for the left colic artery (off IMA) also anterior to the hernia sac.

Arrowhead points to the IMV.



Right paraduodenal: Waldeyer (25% of paraduodenal hernias)

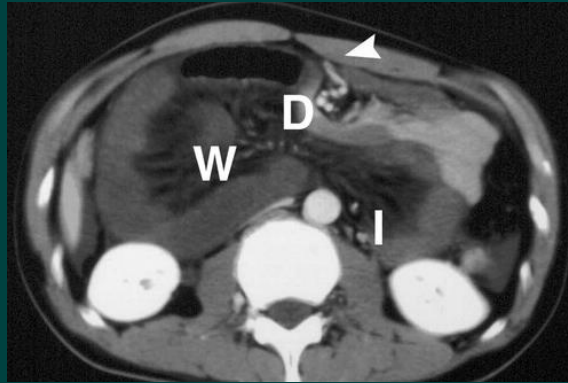
RLQ failed fusion of **ascending** colon mesentery.

Associated with malrotation (if so the SMV will be to the left and ventral to SMA).

Vasculature helps- cluster of loops behind SMV, SMA, right colic artery/vein.

Also anatomically, the loops may be behind the 3rd portion of duodenum.

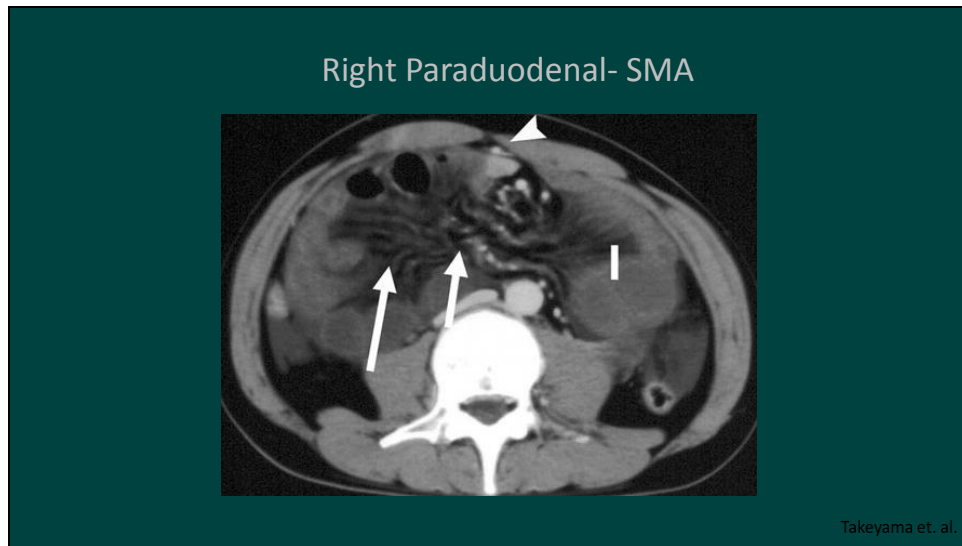
Right Paraduodenal- behind duodenum



Takeyama et. al.

W = waldeyer hernia sac
D = posterior to the duodenum
I = downstream loops of bowel
Arrowhead = SMA

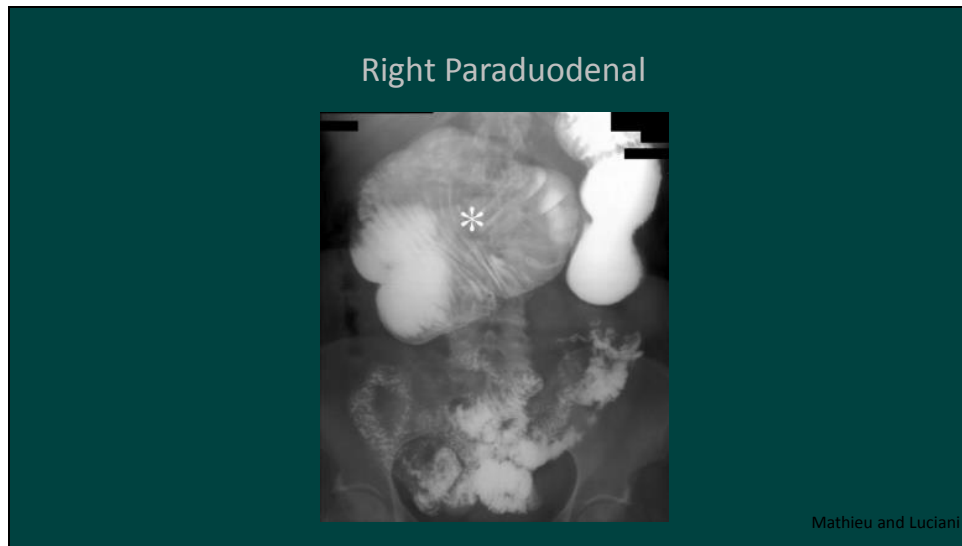
Slide 18



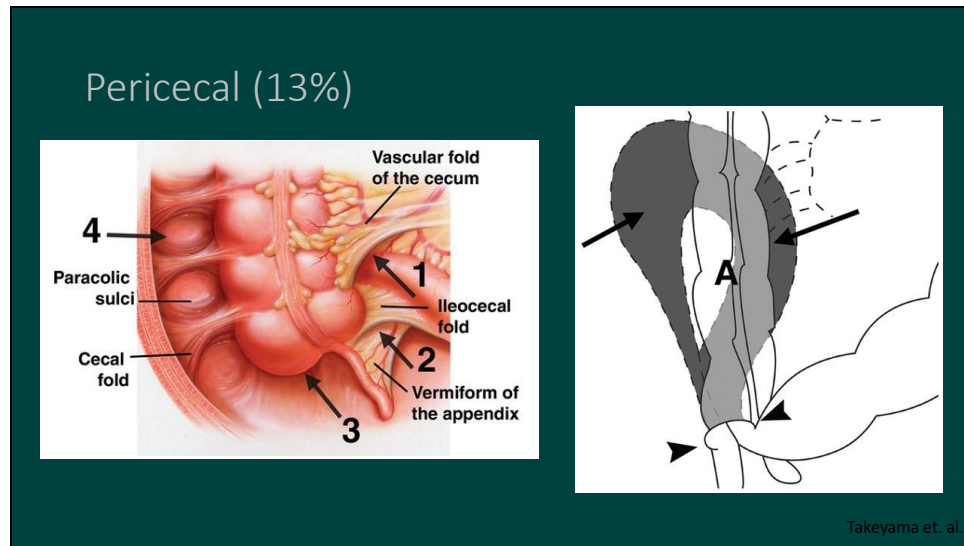
Another slice further down.

Note vascular pedicle– trace it back toward the orifice (mesenteric defect).

Arrowhead- SMA



Same as the left paraduodenal hernia on SBFT, except loops are in the RUQ.



Another differential for colicky RLQ pain, although rare.

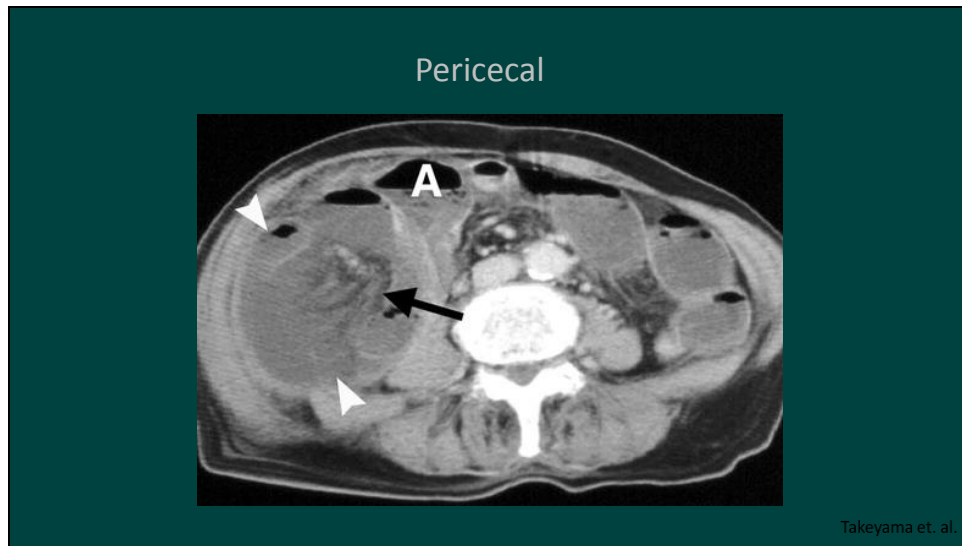
Cecum mesocolon forms around fetal month 5 after rotation occurs.

4 recesses form

- 1- superior ileocecal,
- 2- inferior ileocecal,
- 3- retrocecal,
- 4- paracolic)

Retrocecal the most common/largest hernia

Look for ileal loops posterolateral to the cecum (paracolic gutter)

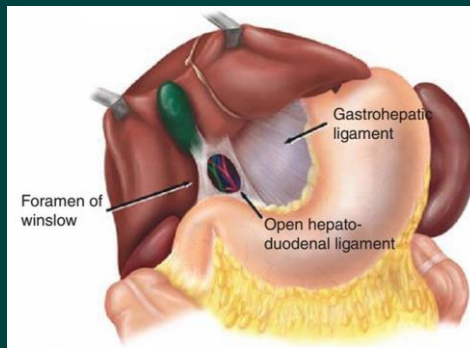


Small bowel in the right paracolic gutter and behind the ascending colon (A).

Black arrow is dilated/stretched mesenteric vessels.

Can look similar to the right paraduodenal– but the ascending colon is displaced medial to the hernia. Not so in the right paraduodenal hernia in which the colon keeps a normal position.

Foramen of Winslow (8%)



<http://y7177.com/sa/anato/foramen/index.htm>

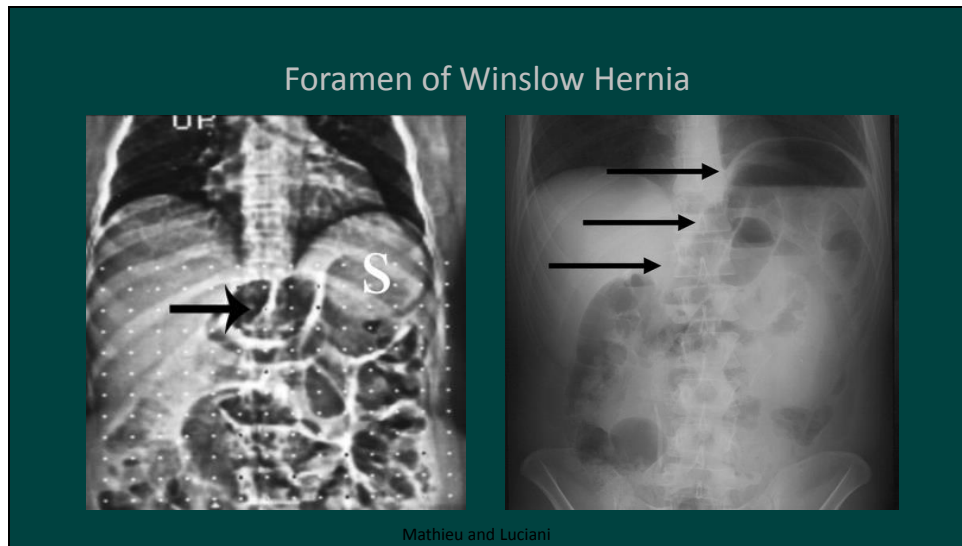
Location: orifice btw lesser sac and peritoneal cavity. Above IVC and below hepatoduodenal ligament (which contains the CBD, HA, and PV).

Contents: 70% have small bowel, 30% colon

Predisposing: long mesentery and enlarged foramen

Look for bowel **loops between IVC and MPV**.

Bowel posterior to the liver/stomach.



Small bowel loops between the stomach and liver on plain film or scout.

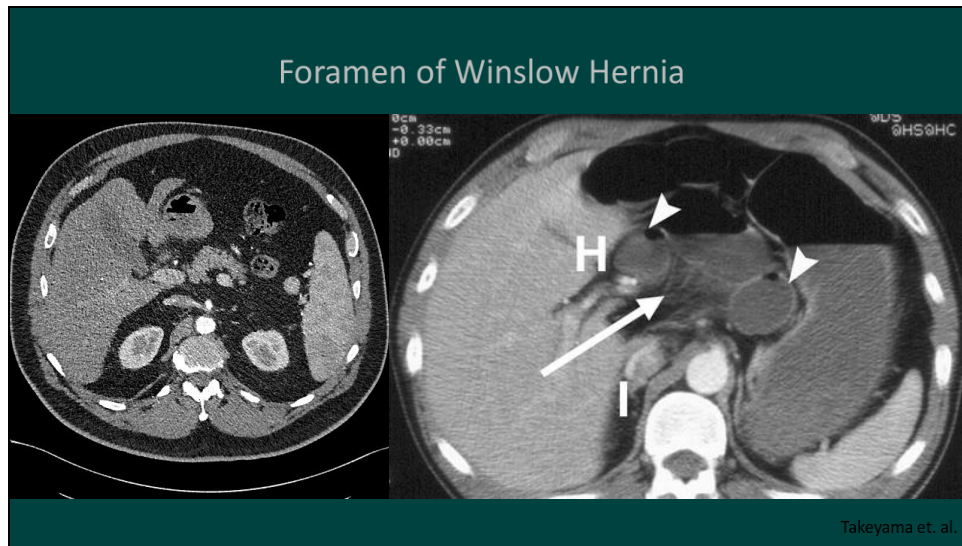
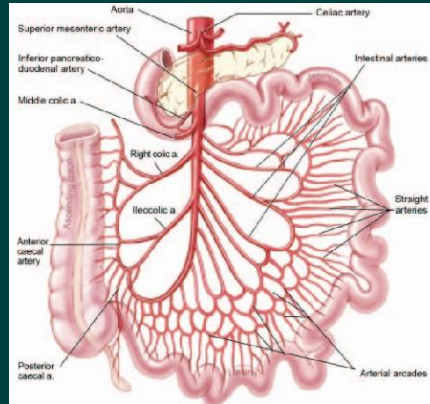


Image 1: Normal– no bowel btw portal vein and IVC

Image 2: Winslow Hernia- above IVC (I) and below hepatoduodenal ligament (H).

Bowel between the stomach and liver in the lesser sac.

Transmesenteric (8%)



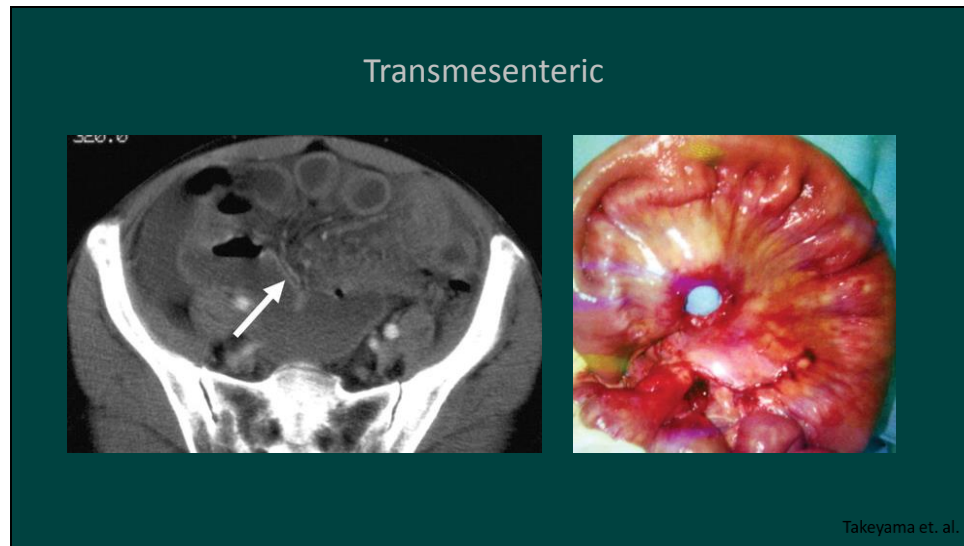
<https://www.semanticscholar.org/paper/Mesenteric-vasculature-guided-small-bowel-on-3D-CT-Zhang-Liu/c59b1b03a0f6b832519a9e8e1599808bad4974c8/figure/0>

Due to a defect in small bowel mesentery.
Congenital (avascular regression)
Acquired (surgery, trauma, inflammation).

Most often occur by the ligament of Treitz or IC valve.

Converging vessels (engorged/stretched/crowded) can help you identify the orifice location.

Difficult to differentiate from a SBO due to adhesions based on imaging alone— need OR confirmation. If you see a closed loop SBO it is fair to say “Closed loop SBO, likely due to adhesions or less commonly a transmesenteric internal hernia.”



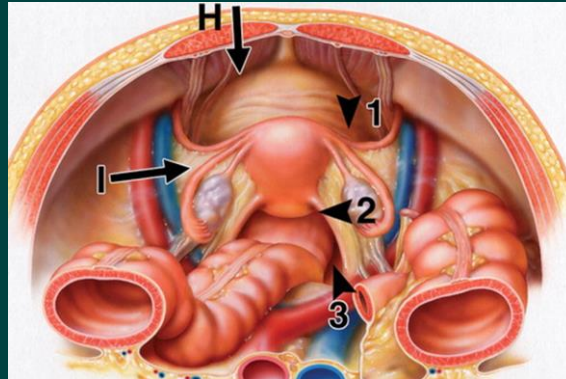
Similar appearance to adhesions— need OR confirmation.

This vascular pedicle leads to an orifice in the lower mid abdomen.
Nice to give surgeons a general region to search in.

Small transmesenteric defect excised in the OR in this patient.

Pelvic Hernias (6%)

H = supraventricular
I = broad ligament
1 = vesicouterine
2 = rectouterine
3 = perirectal

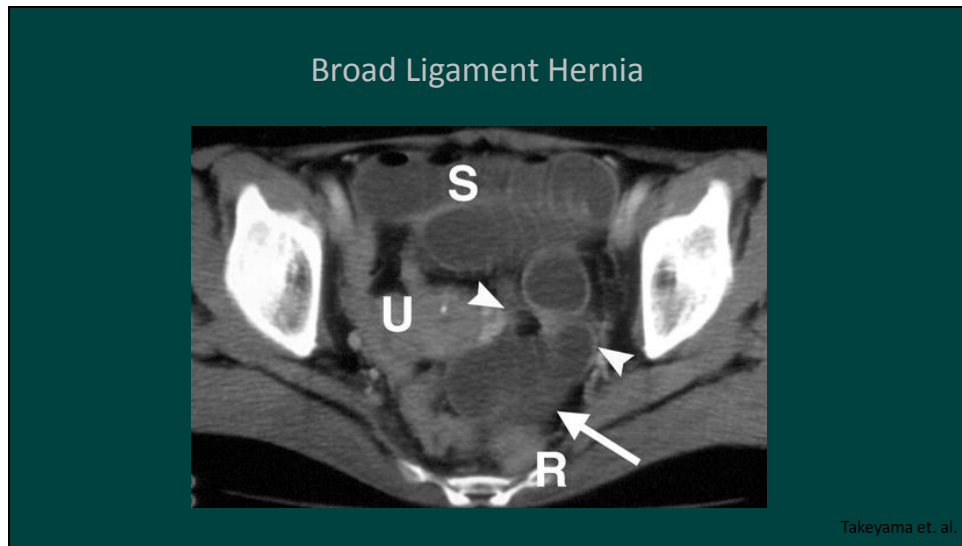


Takeyama et. al.

Male and female anatomy differs slightly. Peritoneum drapes over pelvic structures— in men creating **retrovesicular** pouch btw bladder and rectum. Women have **vesicouterine** pouch and **rectouterine** pouch (of Douglas).

Supraventricular fossa is between the median (urachus) and medial (umbilical arteries) umbilical ligaments. Herniated bowel is in front, beside, or behind the bladder.

Broad ligament hernia: fenestra (both layers of peritoneum have a hole) or pouch-type (one layer has a hole). Most common in parous middle aged women. Dilated small bowel loops in the pelvic cavity. Can push the uterus anterior and rectosigmoid posterior/lateral.

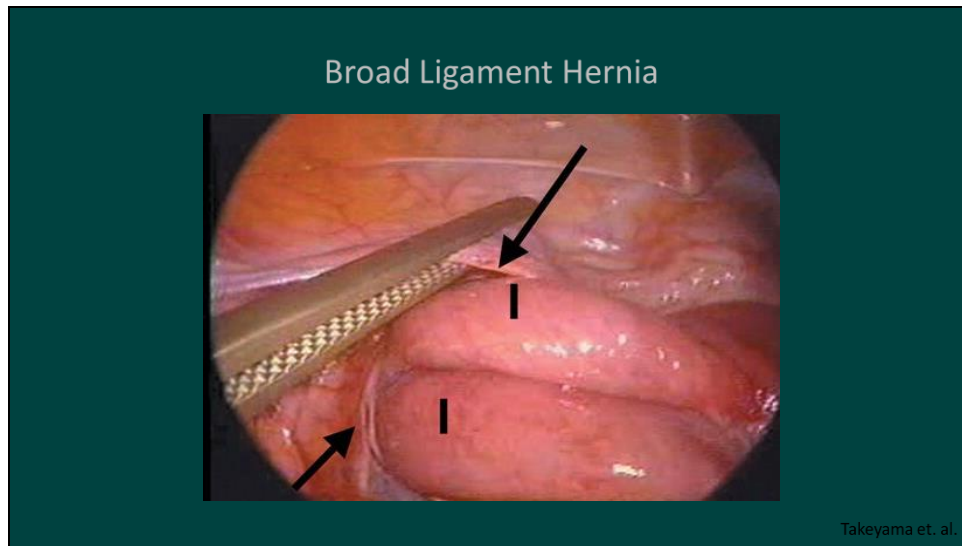


Bowel loops between uterus (U) and rectum (R), displacing the uterus to the right.

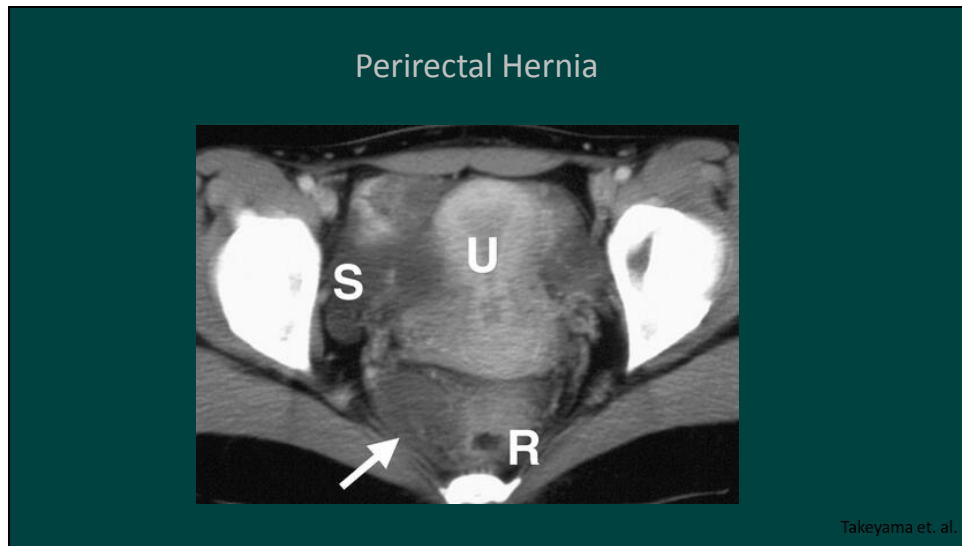
S = small bowel

Arrow heads = location of defect in broad ligament

Multiparous female, no surgical history.

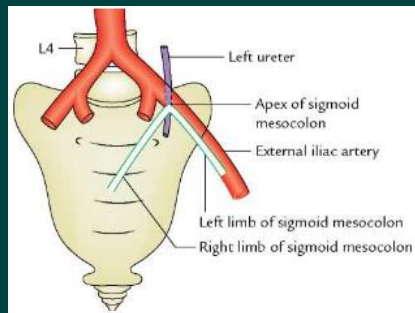


Ileum trapped in broad ligament when patient went to the OR

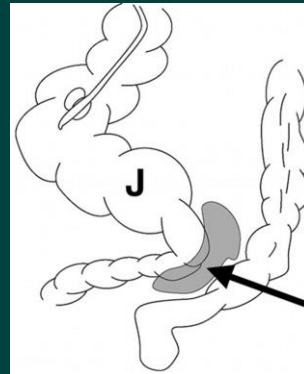


Perirectal hernia- loops next to rectum (R).
Next to uterus (U) too but not displacing it, and not between the uterus and rectum.

Sigmoid mesocolon (6%)



<https://aibolita.com/sundries/15403-falciform-ligament.html>



Takeyama et. al.

Sigmoid mesocolon is shaped like a V:

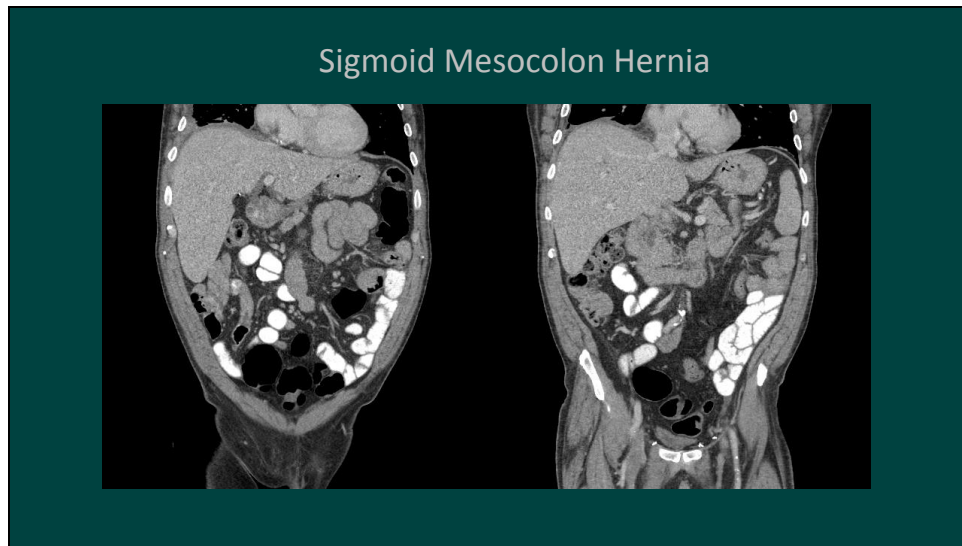
Structures just posterior to the apex: left ureter and iliac vessels

This hernia forms from a small aperture in apex of the sigmoid mesocolon.

3 subtypes by surgery, indistinguishable by imaging.

Small bowel loops herniate into the intersigmoid fossa.

Will see small bowel (usually jejunum) inferior and lateral to the sigmoid colon.



Sigmoid (blue arrow) was anterior to the vascular pedicle (between the blue arrows).

Note small bowel loops clustered in the LLQ.

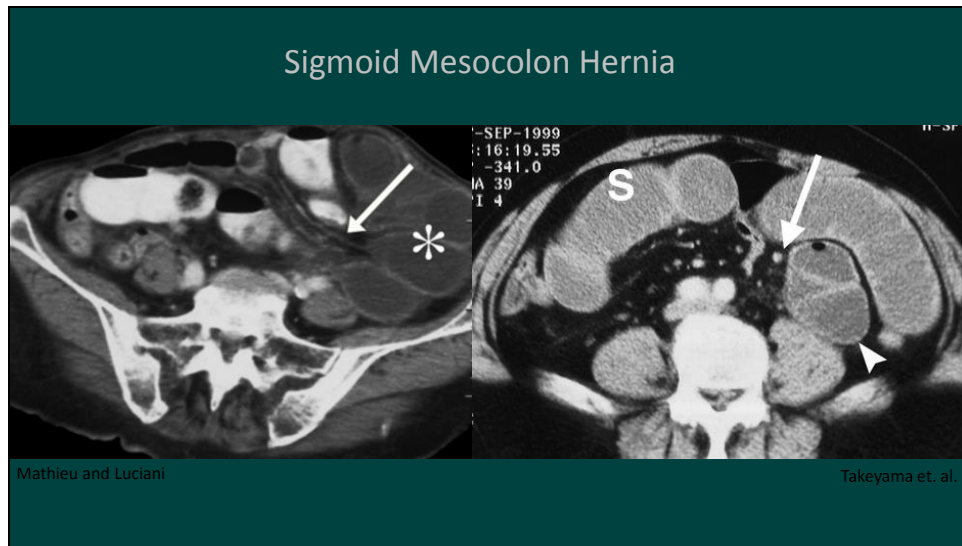
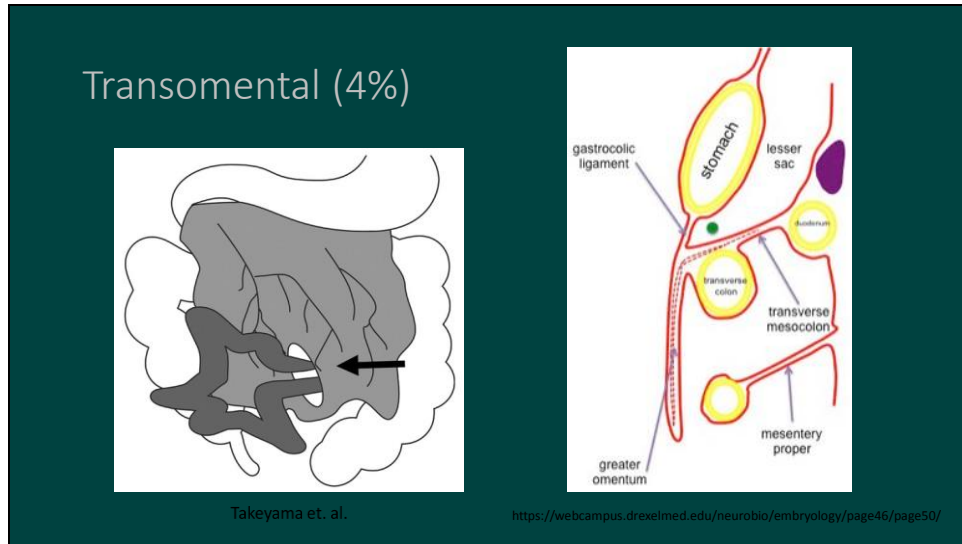


Image 1: bowel loops just anterior to psoas. Clustered in the LLQ with vascular pedicle traced up to orifice at the sigmoid mesocolon apex (located just anterior to where the left ureter crosses the iliac vessels).

Image 2: note the clustered bowel loops are lateral to the IMV (white arrow), which is in the sigmoid mesocolon. Similar to the Left paraduodenal, but lower in the abdomen. You can check to make sure the proximal ileum is still laying as expected to differentiate the two if you're unsure.

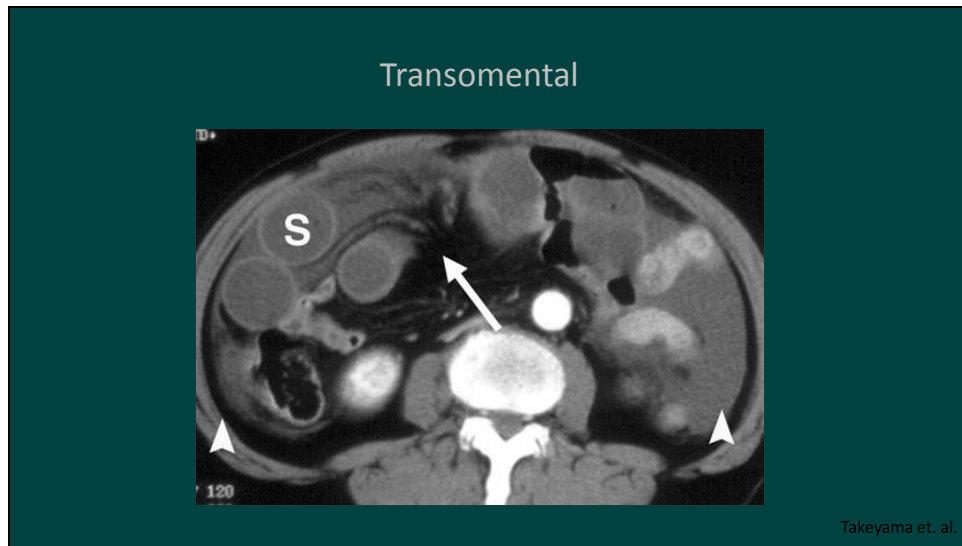


Defect in the mesentery (origin unknown, possibly congenital or traumatic).

Usually lateral edges of mesentery in the most common type.

Gastrocolic ligament (part of omentum making anterior wall of lesser sac— stretched btw greater curve of stomach and transverse colon) less common— would have to have a Foramen of Winslow hernia followed by a transomental hernia.

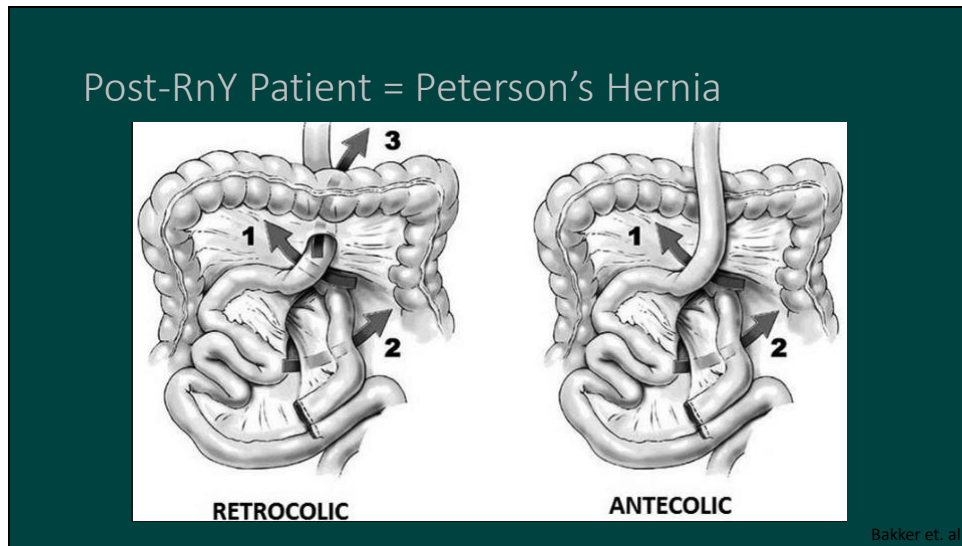
Small bowel, cecum, or sigmoid can be involved.



Vascular pedicle (white arrow) going through orifice adjacent to abdominal wall (aka omentum although we can't see that for sure on CT).

Much like transmesenteric, it is not easily differentiated from SBO due to adhesions.
Need OR confirmation.

Bowel dilated (S) and obstructed. This patient also has scites in the LLQ (arrowhead).



And it wouldn't be a complete internal hernia review without mention of post-surgical internal hernias, most commonly after gastric bypass. These are becoming more common as more people have bypass.

RnY reconstruction creates mesenteric defects that act as possible orifices.

Peterson's space (1): behind alimentary limb (limb connected to stomach) and transverse colon/transverse mesocolon.

More likely with a retrocolic limb (4.5%) versus antecolic (0.4%).

Space behind the hepaticobiliary limb at the JJ anastomosis (2).

Swirl sign is present only 75% of the time.

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