

Internal Hernias

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Definition

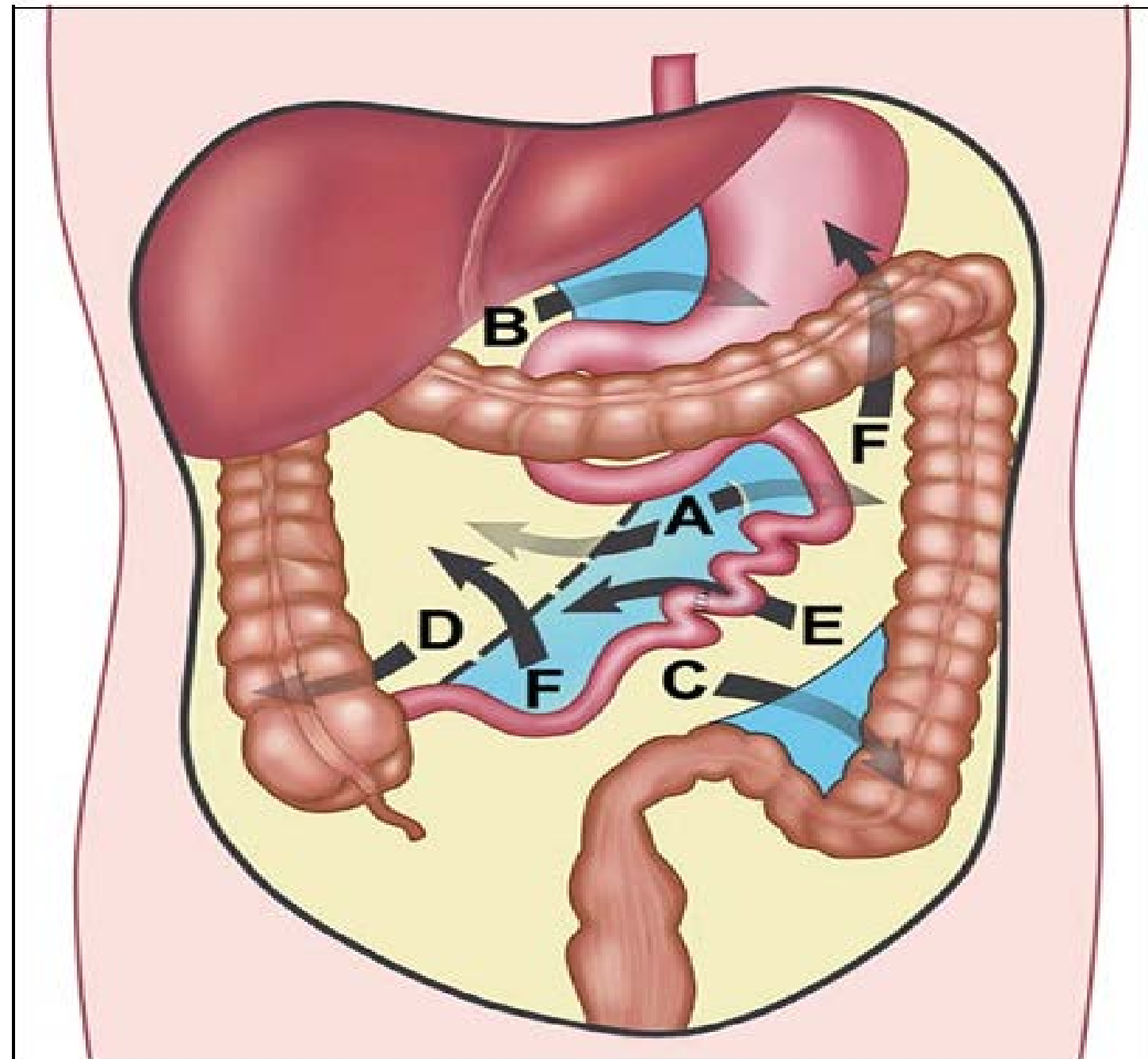
Protrusion of a viscus through a normal or abnormal peritoneal or mesenteric aperture within the confines of the peritoneal cavity

Classification

- Paraduodenal (53%)
- Pericecal (13%)
- Foramen of Winslow (8%)
- Transmesenteric and transmesocolic (8%)
- Intersigmoid (6%)
- Retroanastomotic (5%)
- Paravesical (7%)

Meyers MA. Dynamic radiology of the abdomen: normal and pathologic anatomy, 4th ed.
New York, NY: Springer-Verlag, 1994

Fig. 1—Diagrammatic illustration shows various types of internal hernias:
A = paraduodenal,
B = foramen of Winslow,
C = intersigmoid,
D = pericecal,
E = transmesenteric, and
F = retroanastomotic.



Epidemiology

- No age/sex predilection
- Overall incidence 0.2 to 0.9 %
- Autopsy incidence 0.2% to 2%
- 5.8 % of all intestinal obstructions
- More than 50 % of all SBO after surgery for morbid obesity

Meyers ma. Dynamic radiology of the abdomen: normal and pathologic anatomy, 4th ed.
New york, NY: springer-verlag, 1994

D/D

- Adhesions (80%)
- External hernia (2 to 8 %)
- Undiagnosed Crohn's disease obstructing the small bowel
- An incarcerated femoral or obturator hernia
- An obstructing phytobezoar
- Gallstone ileus
- Obstructing neoplasms

Clinical Findings

- Asymptomatic
- Significant discomfort
 - Constant vague epigastric pain
 - Intermittent colicky periumbilical pain
- Nausea
- Vomiting (especially after large meal)
- Recurrent intestinal obstruction
- Depends on
 - Duration
 - Reducibility
 - Presence or absence of incarceration and strangulation
 - Position

Paraduodenal Hernias

Most common type of internal hernia - 53%

50% of the 500 cases published up to the year 2000

Mesentericoparietal

Congenital mesocolic

Retroperitoneal

Left - 75 %

Right - 25%

M : F = 3 : 1

Mean age of 38 years

Pathogenesis

- Andrews proposed that PDH forms as a result of a congenital anomaly in development of the peritoneum that arises during midgut rotation
- Peltier et al described the mechanism as either being acquired or related to anomalous rotation of the midgut (physiologic herniation during the sixth to eleventh weeks of gestation)

Left Paraduodenal hernia

- 40 %
- 75%
- Landzert's fossa - 2%

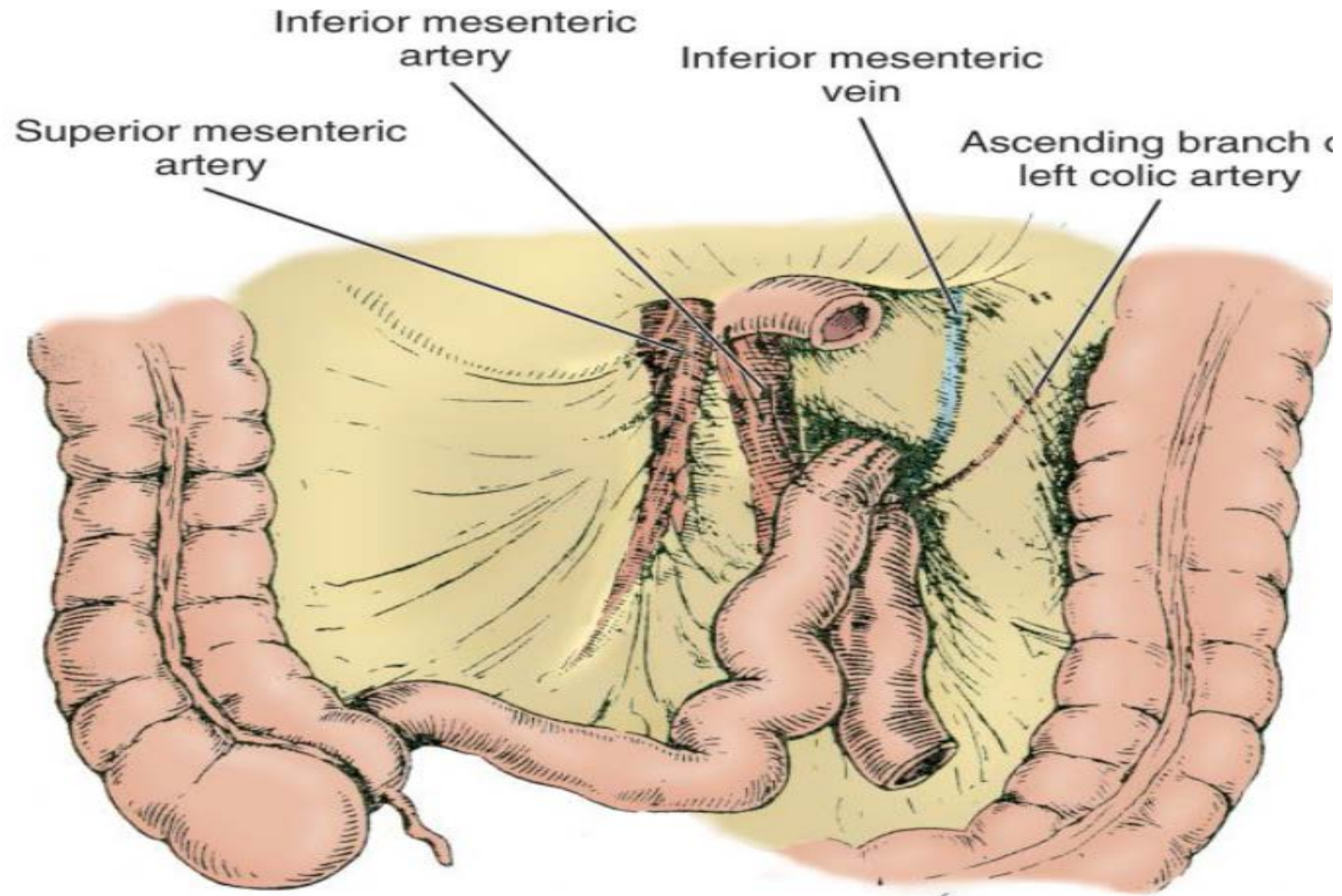
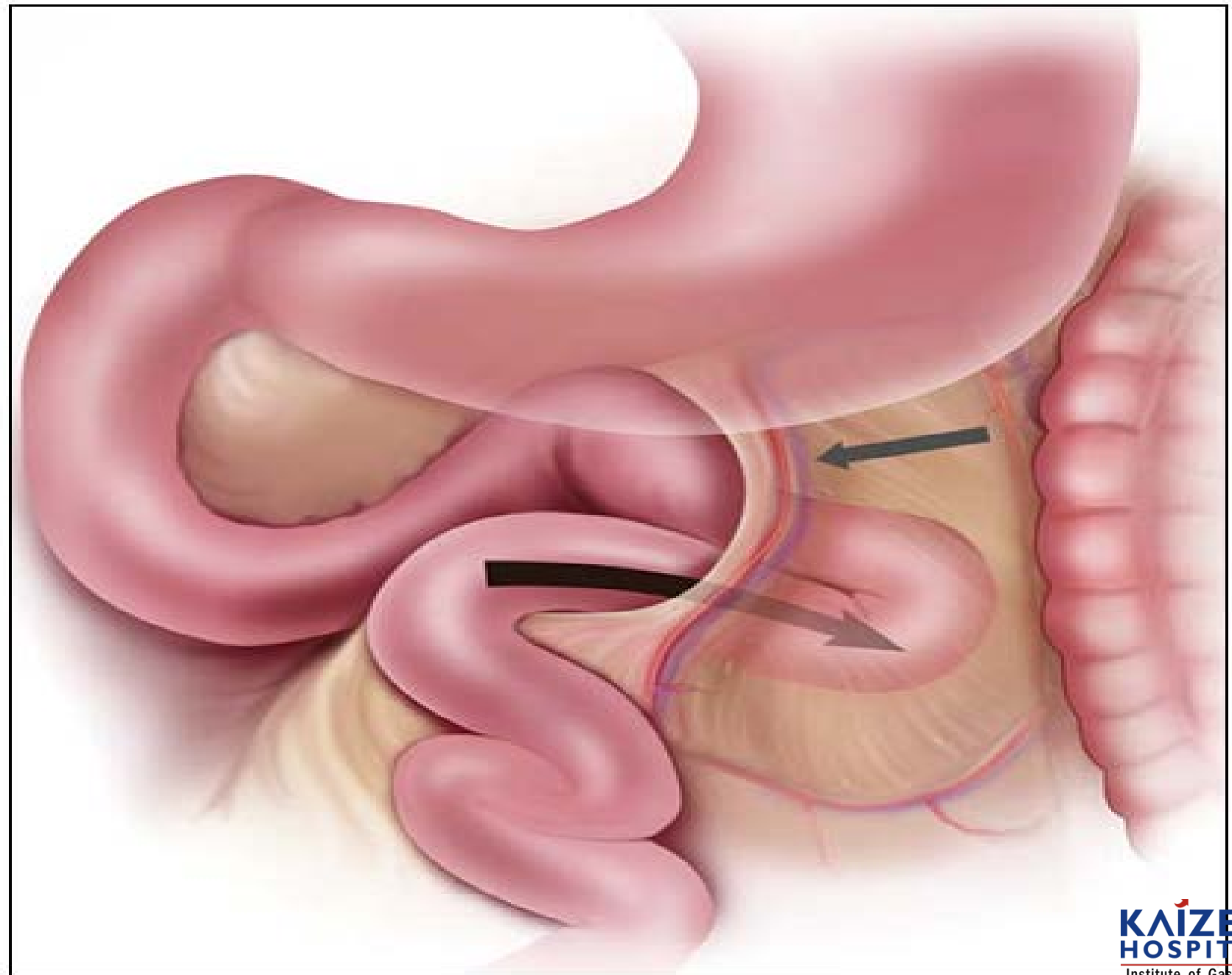


Figure 74-1 Left paraduodenal hernia. The opening of the hernia sac lies above the ascending branch of the left colic artery and the inferior mesenteric vein. The sac lies behind the left mesocolon.

| Hernia Type | Subtype | Incidence | Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|--------------------|----------------------------|--|---|---|--|---|
| Left para-duodenal | Congenital normal aperture | 40% of all hernias, 75% of Para-duodenal hernias | Postprandial pain, may date back to childhood | Encapsulated cluster of jejunum in LUQ, lateral to the ascending duodenum; may have mass effect indenting posterior wall of stomach or displacing transverse colon inferiorly | Clustered dilated small-bowel loops between stomach and pancreas, behind pancreas itself, or between transverse colon and left adrenal gland | IMV in neck of hernial sac with anterior and upward displacement of IMV |

Fig. 2—Graphic illustration of a left paraduodenal hernia depicts loop of small bowel prolapsing (*curved arrow*) through Landzert's fossa, located behind inferior mesenteric vein and ascending left colic artery (*straight arrow*). Herniated bowel loops are therefore located lateral to fourth portion of duodenum.

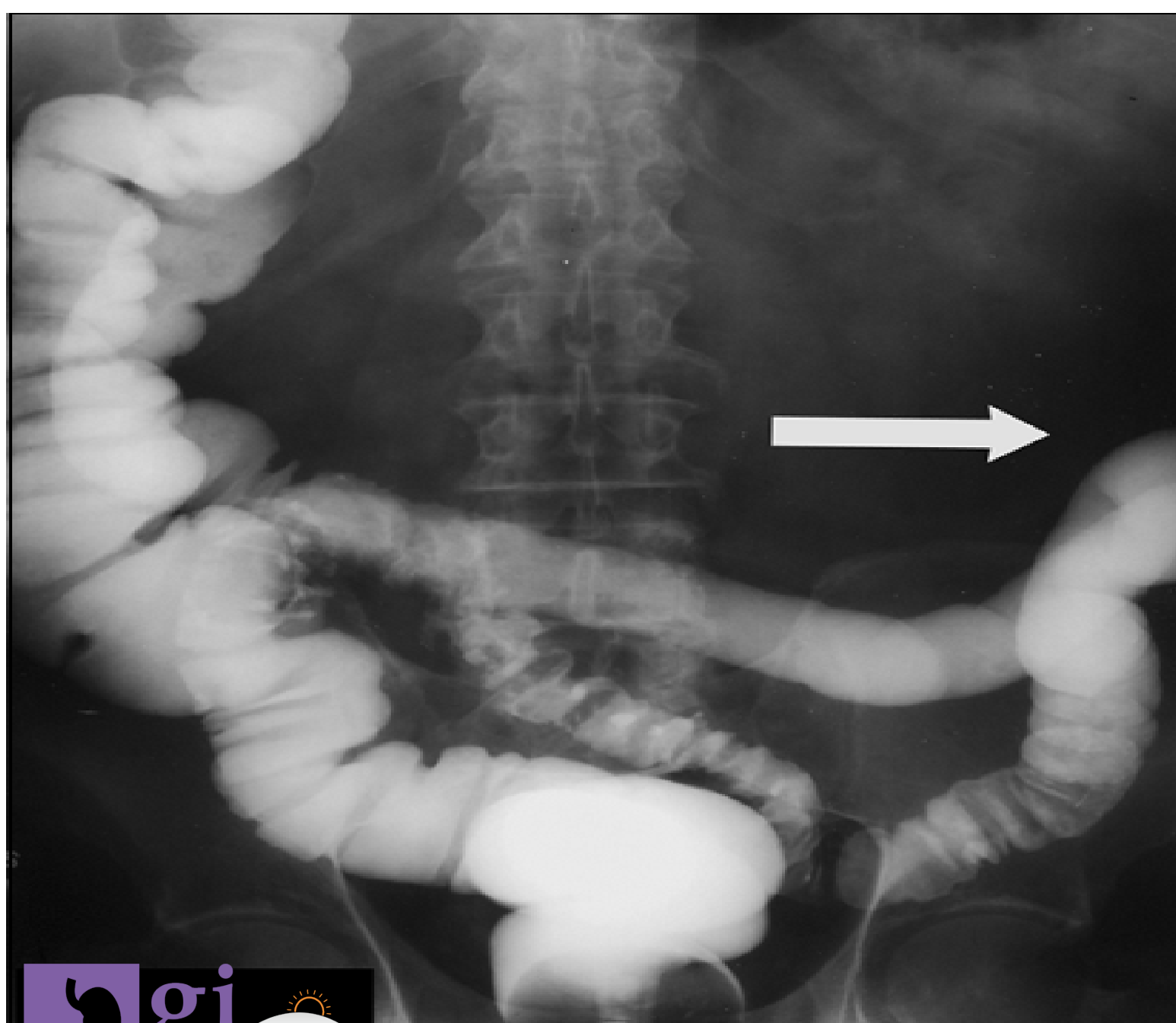




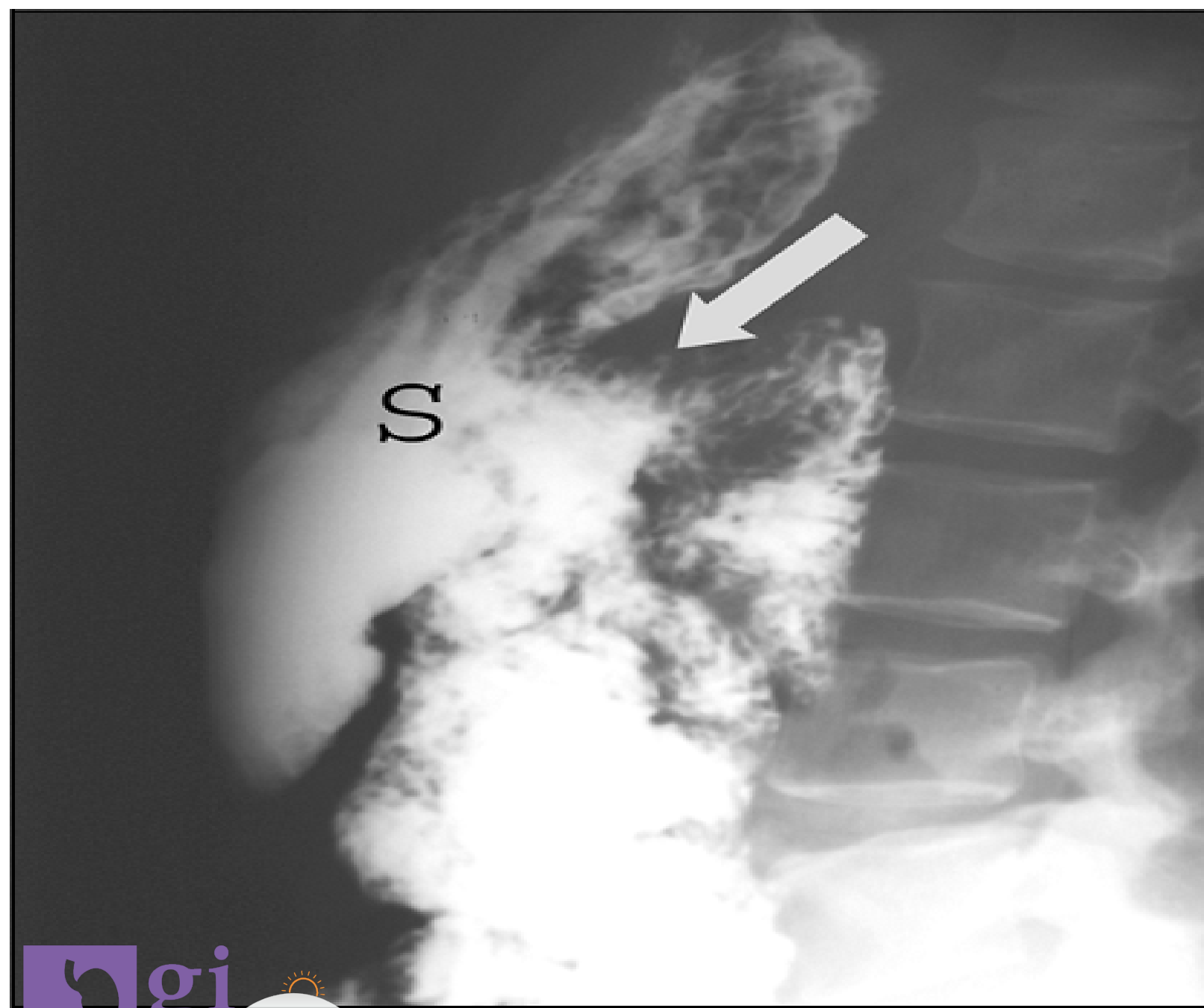
Left paraduodenal hernias shown on upper gastrointestinal series, and barium enema in one patient and lateral view of upper gastrointestinal series from different patients.

A, 55-year-old man with gastrointestinal bleeding.

Anteroposterior projection of oral contrast small-bowel study shows cluster of small-bowel loops in left upper quadrant, lateral to fourth portion of duodenum (arrow).

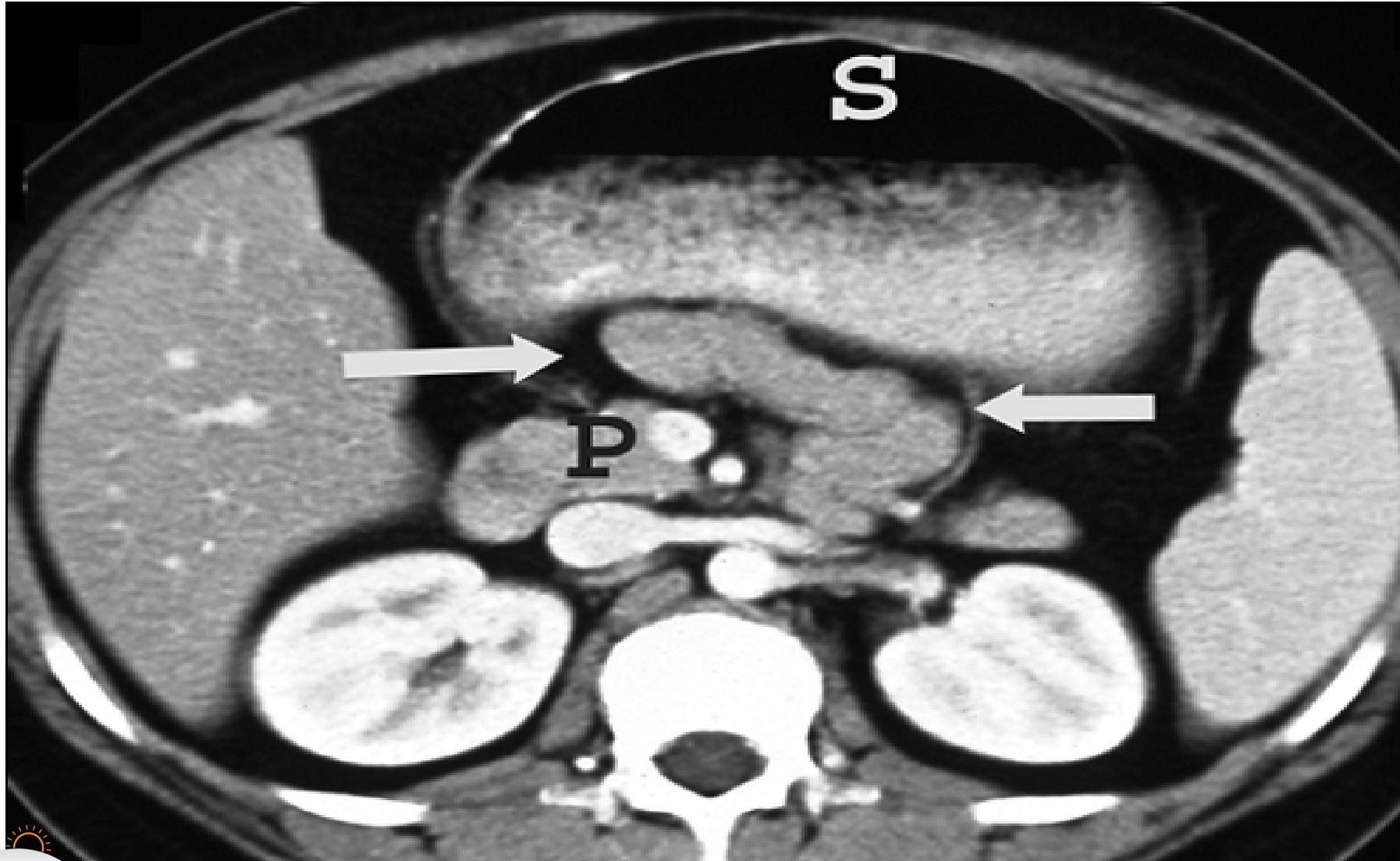


B, Barium enema study (anteroposterior projection) from same patient as in A depicts inferior displacement of distal transverse colon and splenic flexure (arrow) caused by mass in left upper quadrant that was later revealed to be left paraduodenal hernia.

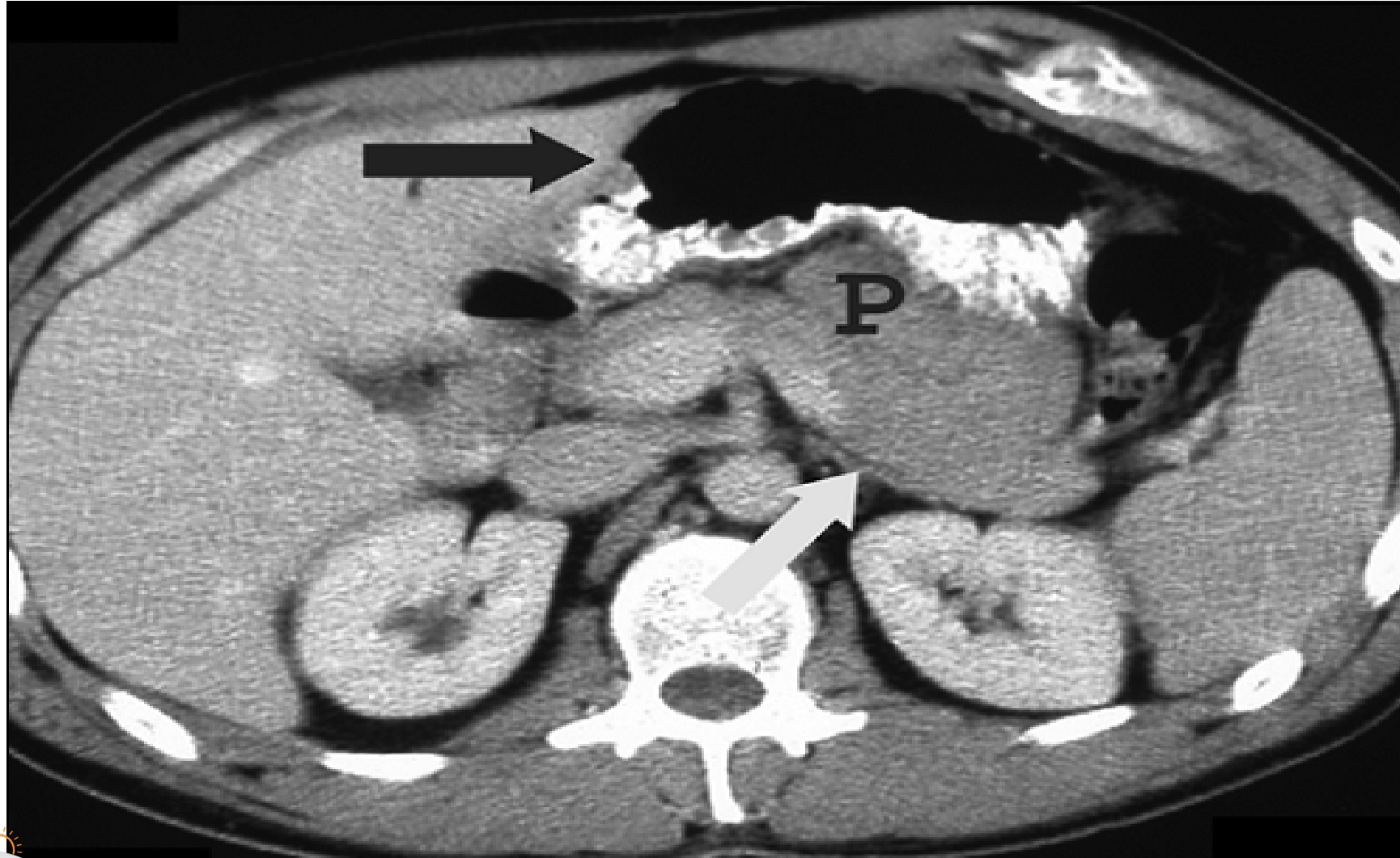


Lateral radiograph from upper gastrointestinal series in 35-year-old woman with abdominal pain shows small-bowel loops (arrow) causing mass effect and indentation on posterior aspect of stomach (S), displacing it anteriorly

Axial contrast-enhanced CT scan in 11-year-old boy shows small-bowel loops (arrows) between stomach (S) and pancreas (P).



Axial contrast-enhanced CT scan in 28-year-old man shows small-bowel loops (white arrow) behind pancreas (P) itself. Black arrow indicates stomach



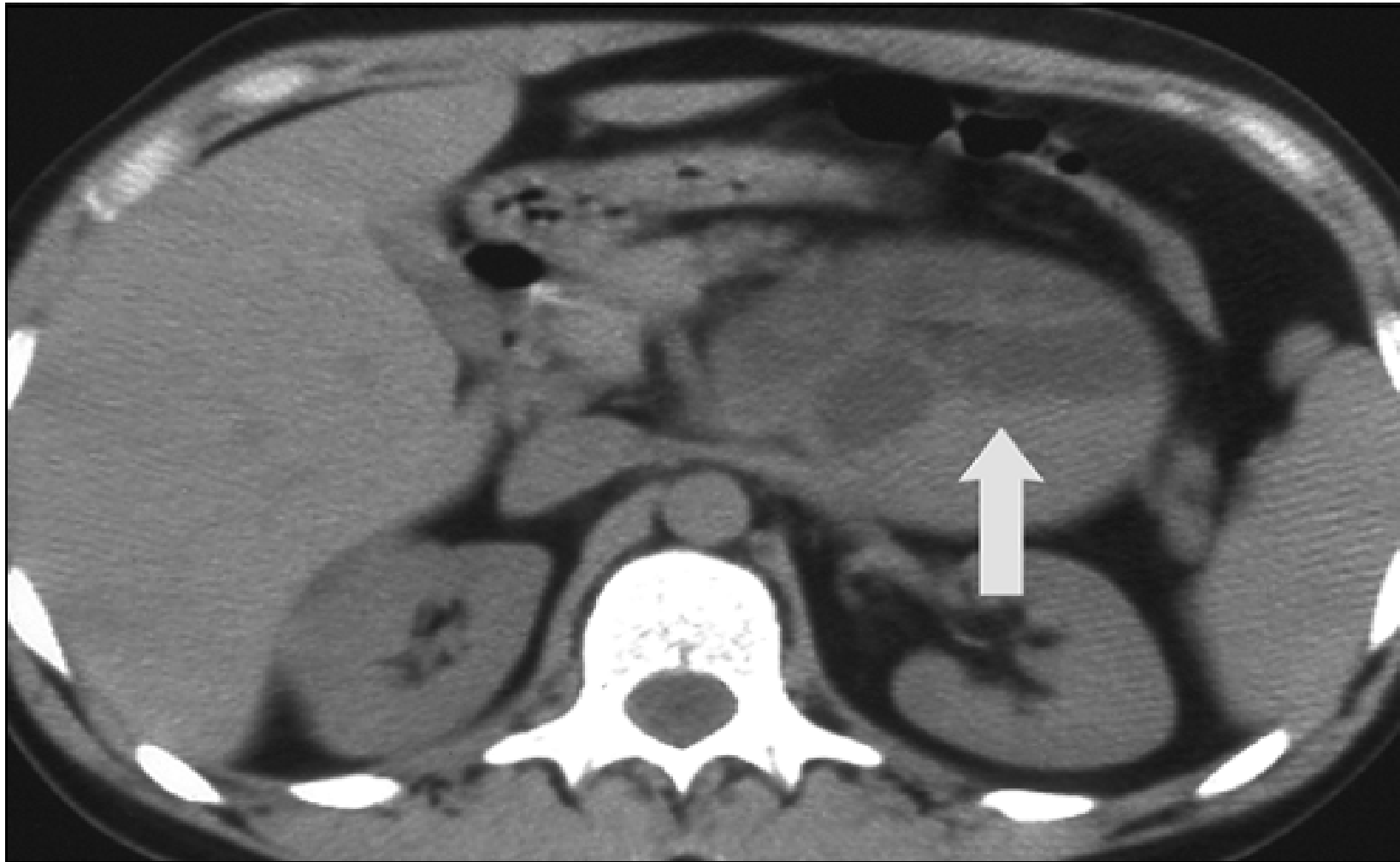
Axial contrast-enhanced CT scan in 36-year-old man shows small-bowel loops (arrows) displaying inferior mesenteric vein (arrowhead) to left



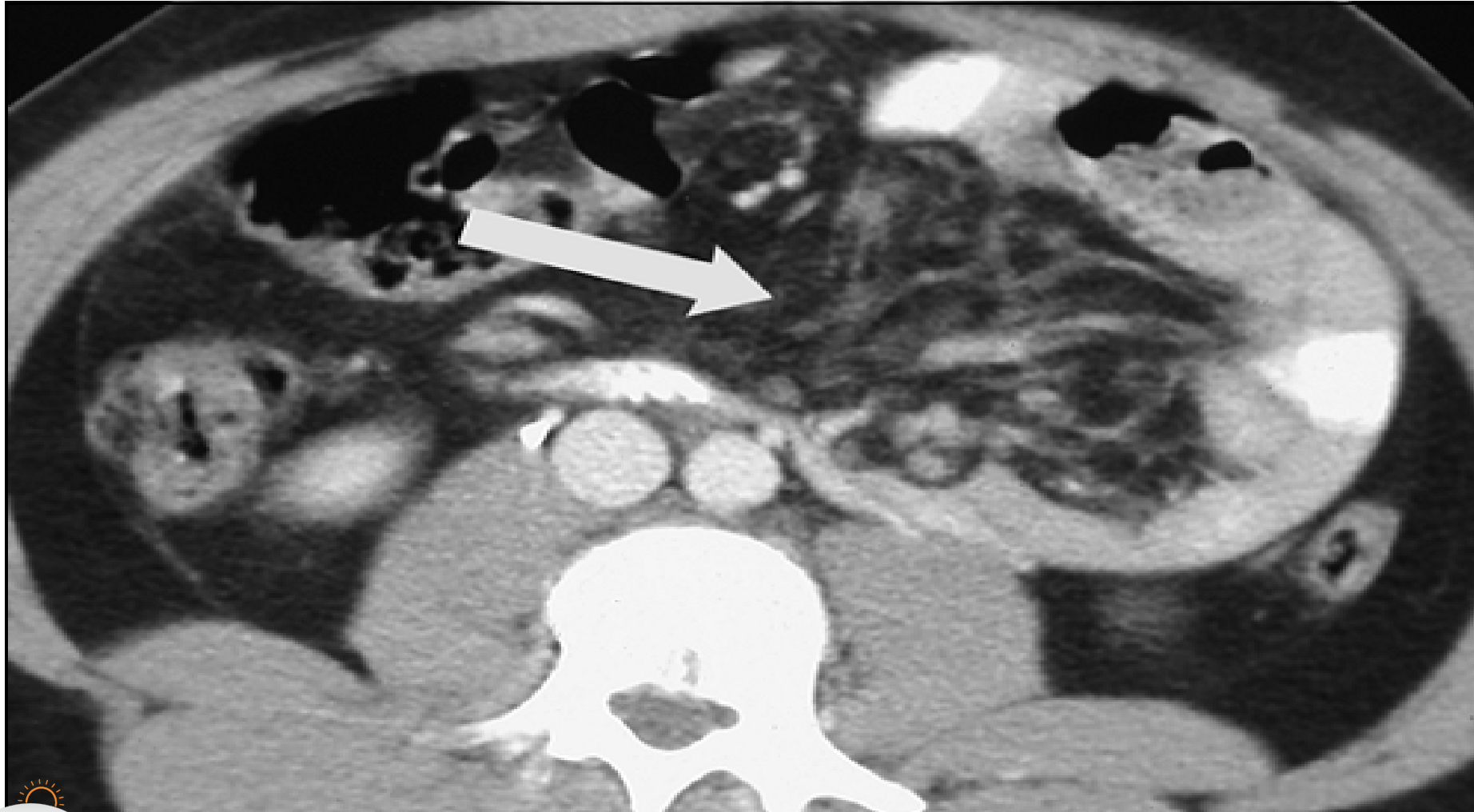
Coronal reconstruction of contrast-enhanced CT data set in 28-year-old man shows small-bowel loops between transverse colon (T) and left adrenal gland (arrow)



Unenhanced axial CT scan in 35-year-old man shows evidence of small-bowel obstruction of herniated contents as multiple loops of dilated small bowel (arrow) with fluid–fluid levels noted



Axial contrast-enhanced CT scan in 23-year-old man shows multiple engorged and prominent vessels (arrow) in herniated sac caused by vascular congestion and obstruction.



Right Paraduodenal hernia

13 %

25%

Waldeyer's Fossa-1 %

| Hernia Type | Subtype | Incidence | Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|---------------------|-----------------------------|--|---|--|--|--------------------------|
| Right para-duodenal | Congenital, normal aperture | 13% of all hernias, 25% of Para-duodenal hernias | Postprandial pain, may date back to childhood | En-capsulated loops lateral and inferior to the descending duodenum; associated with small-bowel nonrotation | En-capsulated loops lateral and inferior to the descending duodenum; associated with small-bowel nonrotation | SMA displaced anteriorly |

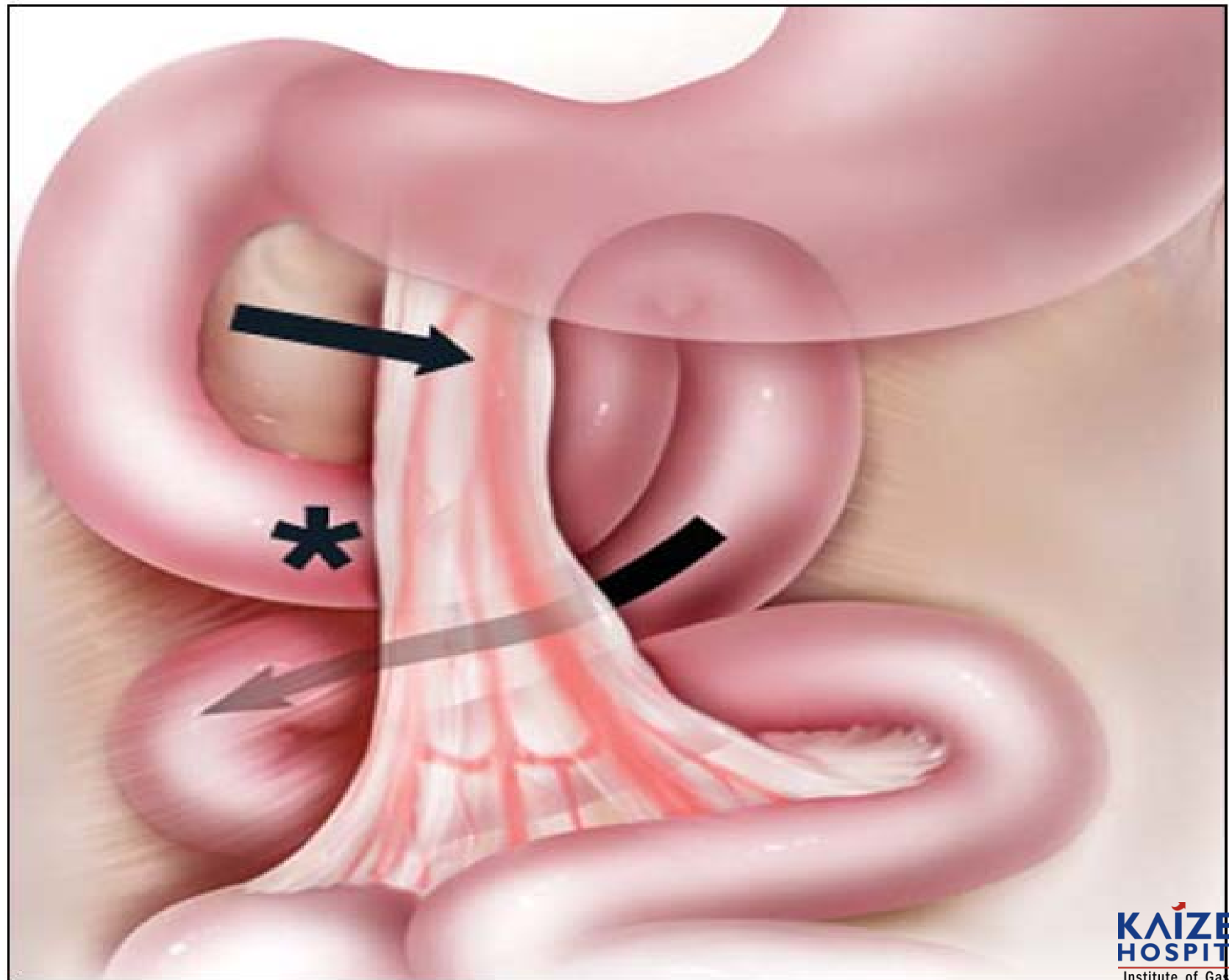


Fig. 5—Graphic illustration of right paraduodenal hernia shows loop of small bowel prolapsing (*curved arrow*) through Waldeyer's fossa, behind superior mesenteric artery (*straight arrow*) and inferior to third portion of duodenum (asterisk).

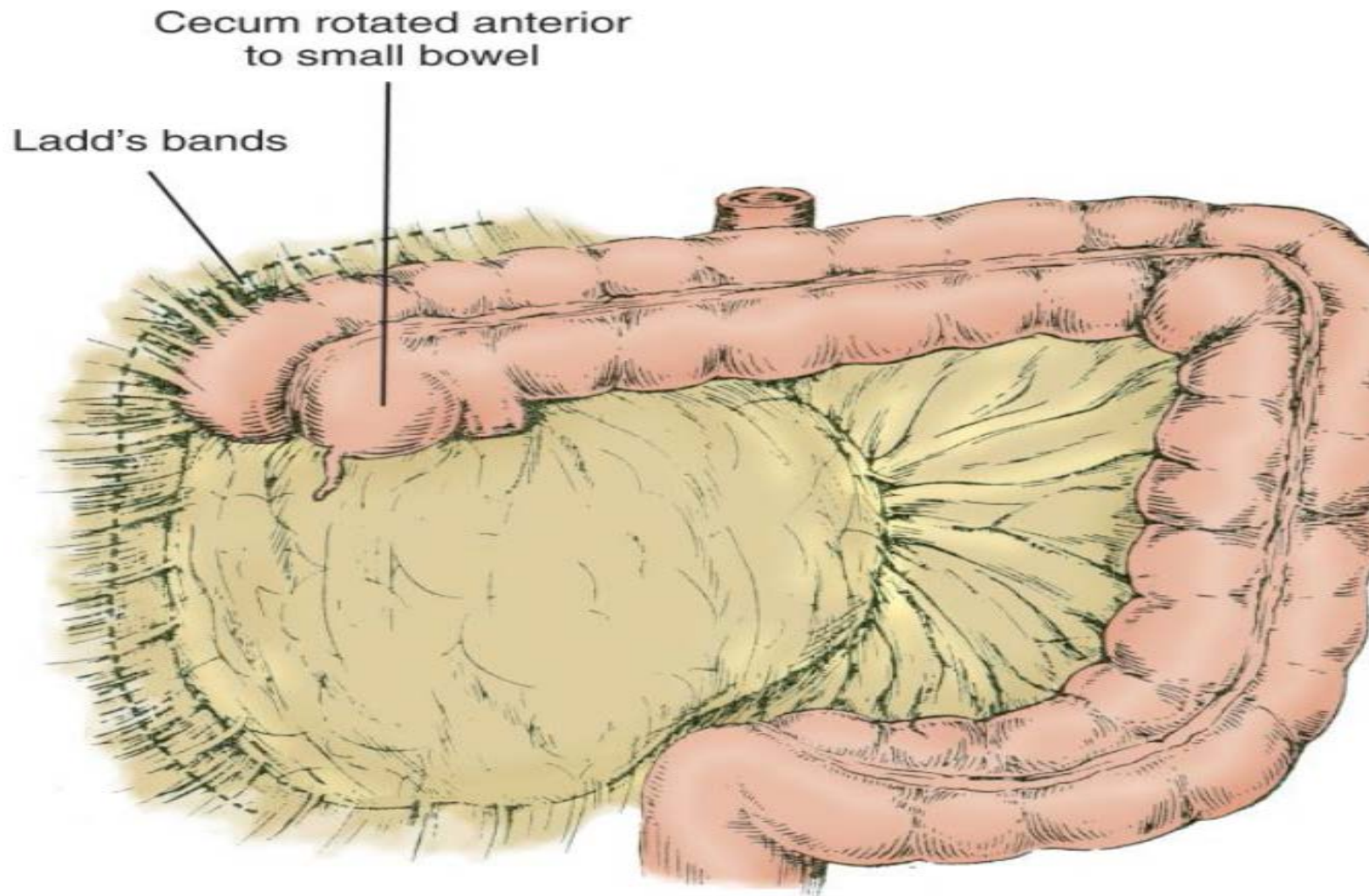
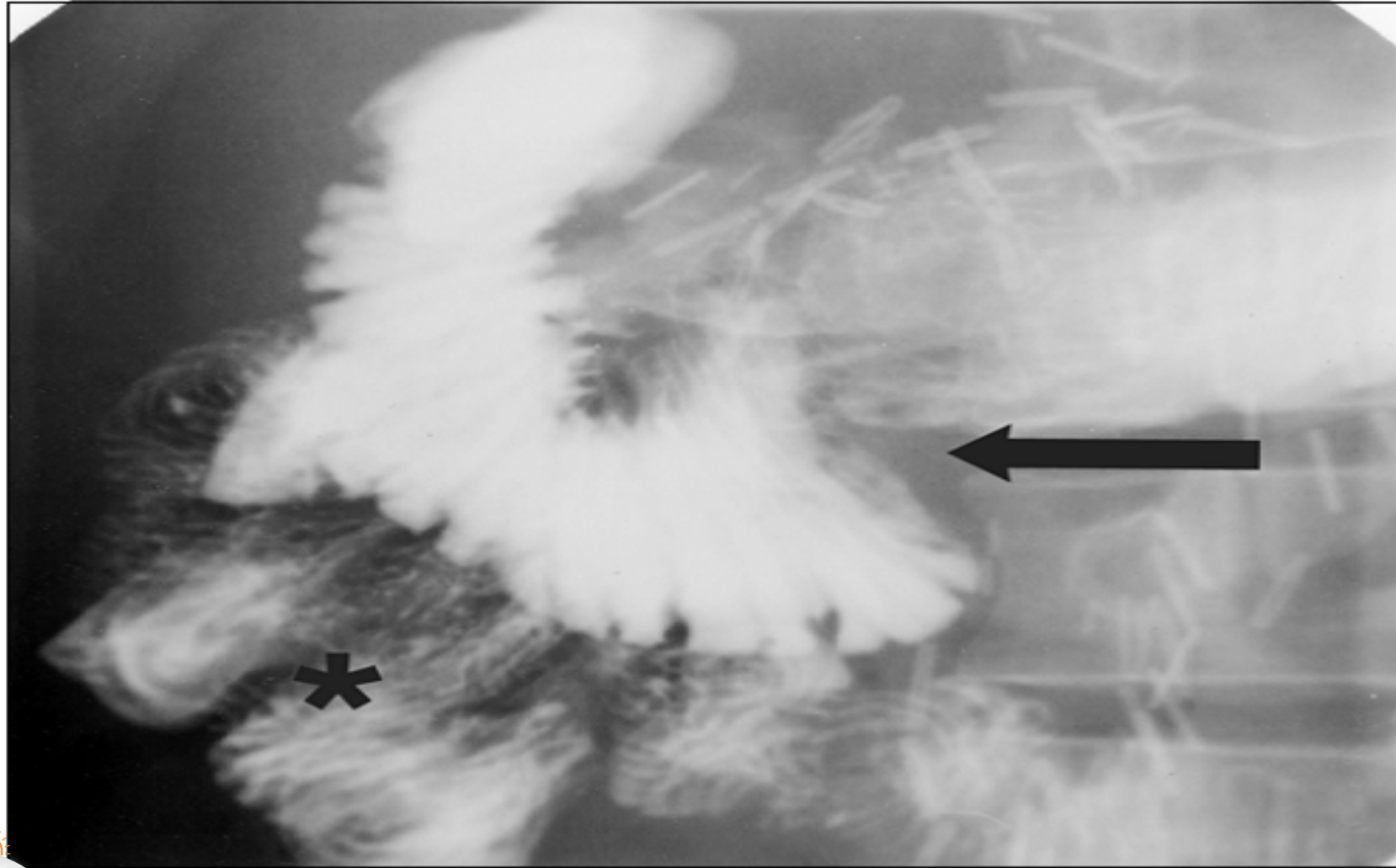
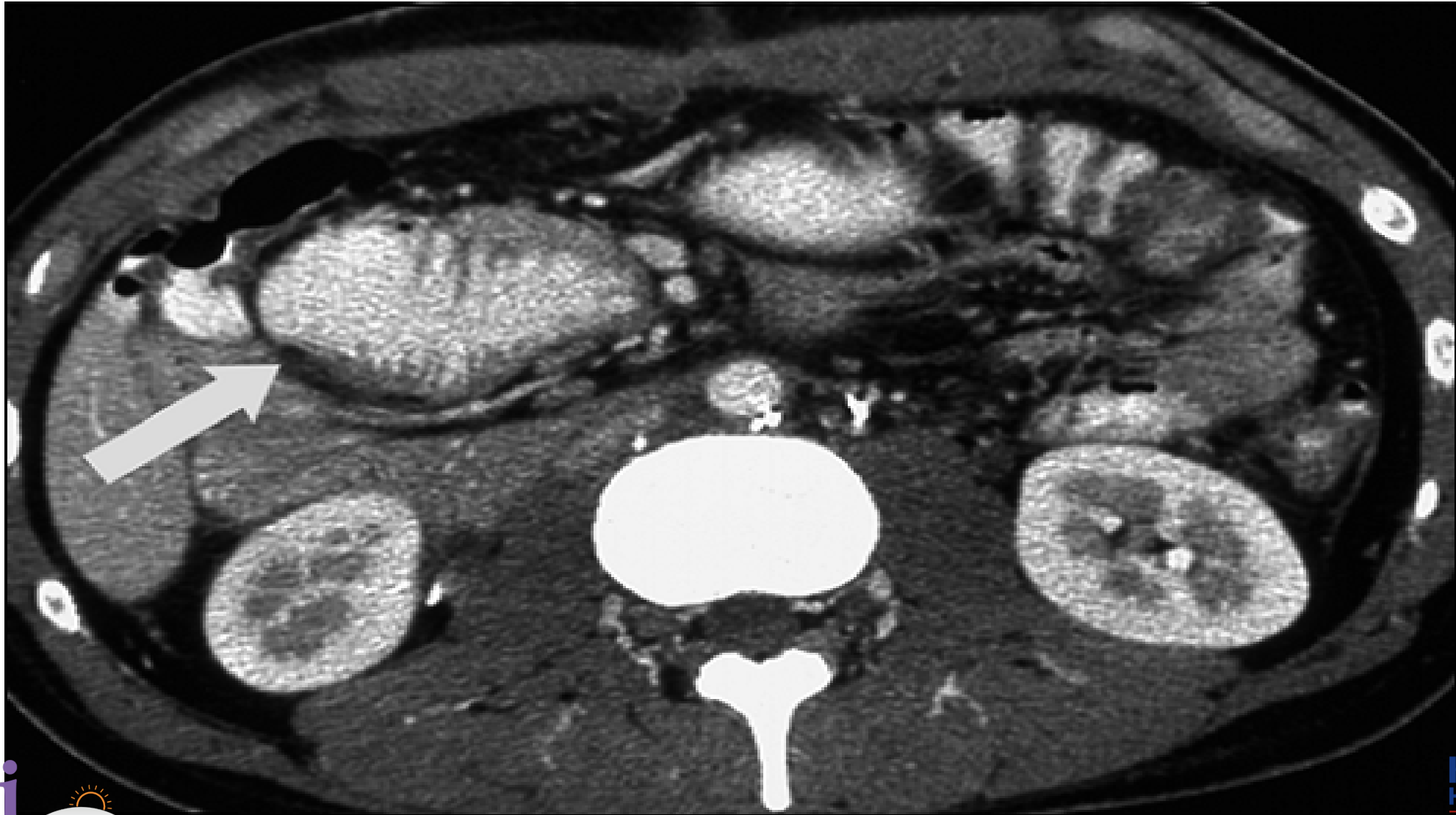


Figure 74-2 Right paraduodenal hernia. This hernia is caused by failure of the small bowel to rotate to the left with the right colon continuing to rotate anterior to it. This results in trapping of the small bowel behind the right mesocolon when fusion with the retroperitoneum occurs. The *dotted line* represents the plane opened to mobilize the right colon and reduce the hernia.

23-year-old man with abdominal pain. Anteroposterior projection from oral contrast small-bowel study reveals cluster of small-bowel loops (asterisk) posterior and lateral to second and third portions of duodenum (arrow)



Contrast-enhanced CT scan shows abnormal loop of small bowel (arrow) in right upper quadrant and reveals right paraduodenal hernia



Management of PDH

- Lifetime risk for bowel incarceration 50%
- Principals
 - Reduction of the hernia contents
 - Resection of the hernia sac
 - Restoration of normal bowel anatomy
 - Repair of the hernia defect
- Hernia opening widening
- Sac opening
- Laparoscopy versus open

Pericecal Hernia

13%

Pericecal fossa

Ileocolic

Retrocecal(Hernia of Rieux)

Ileocecal

Paracecal

| Hernia Type | Subtype | Incidence | Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|-------------|--|-----------|--|---|---|------------|
| Peri-cecal | Congenital or acquired abnormal aperture | 13% | RLQ pain, differential diagnosis of appendicitis; high incidence of occlusive symptoms | Clustered small-bowel loops (usually distal) posterior and lateral to the cecum in right paracolic gutter | Clustered small-bowel loops (usually distal) posterior and lateral to the cecum in right paracolic gutter | None |

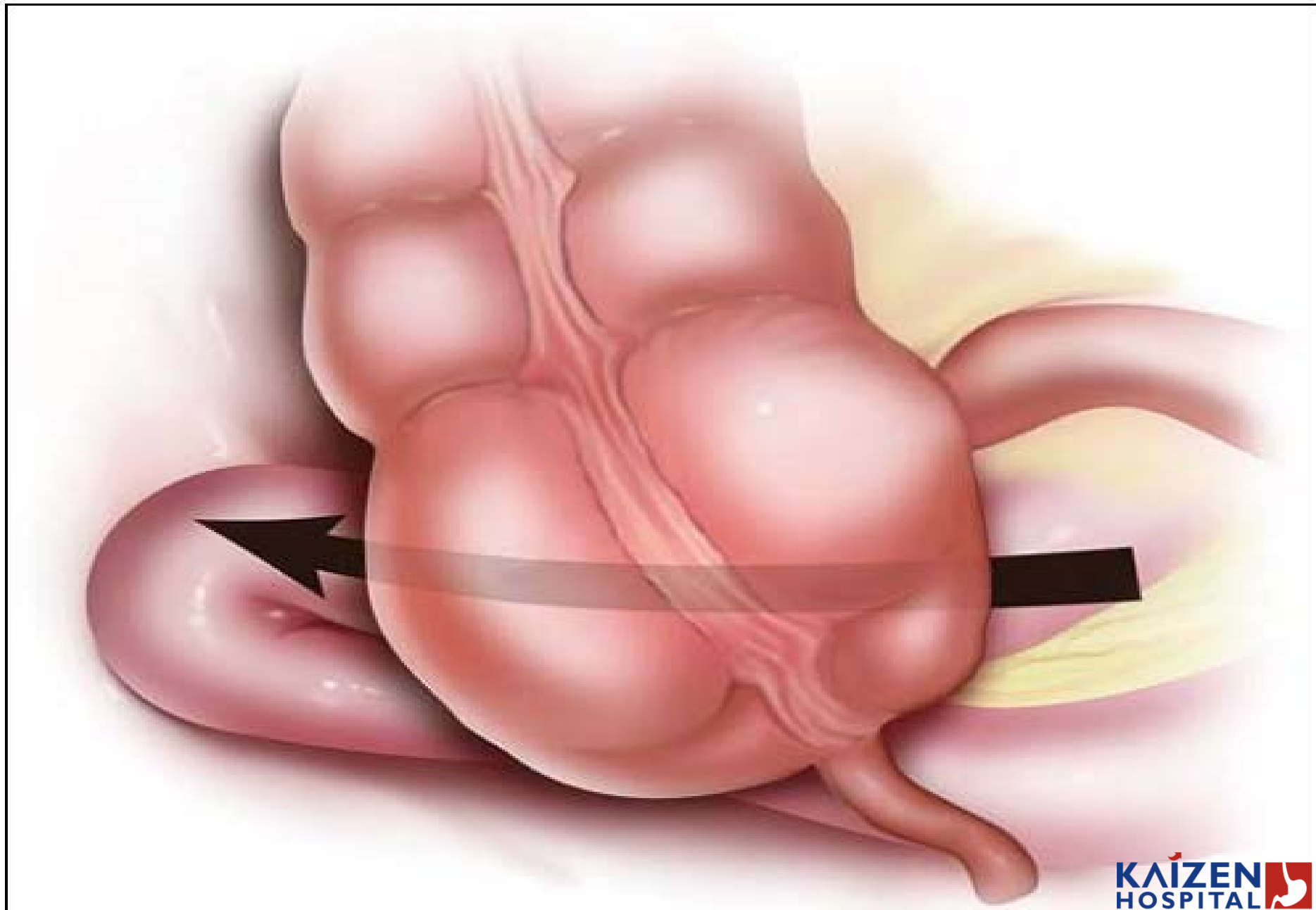
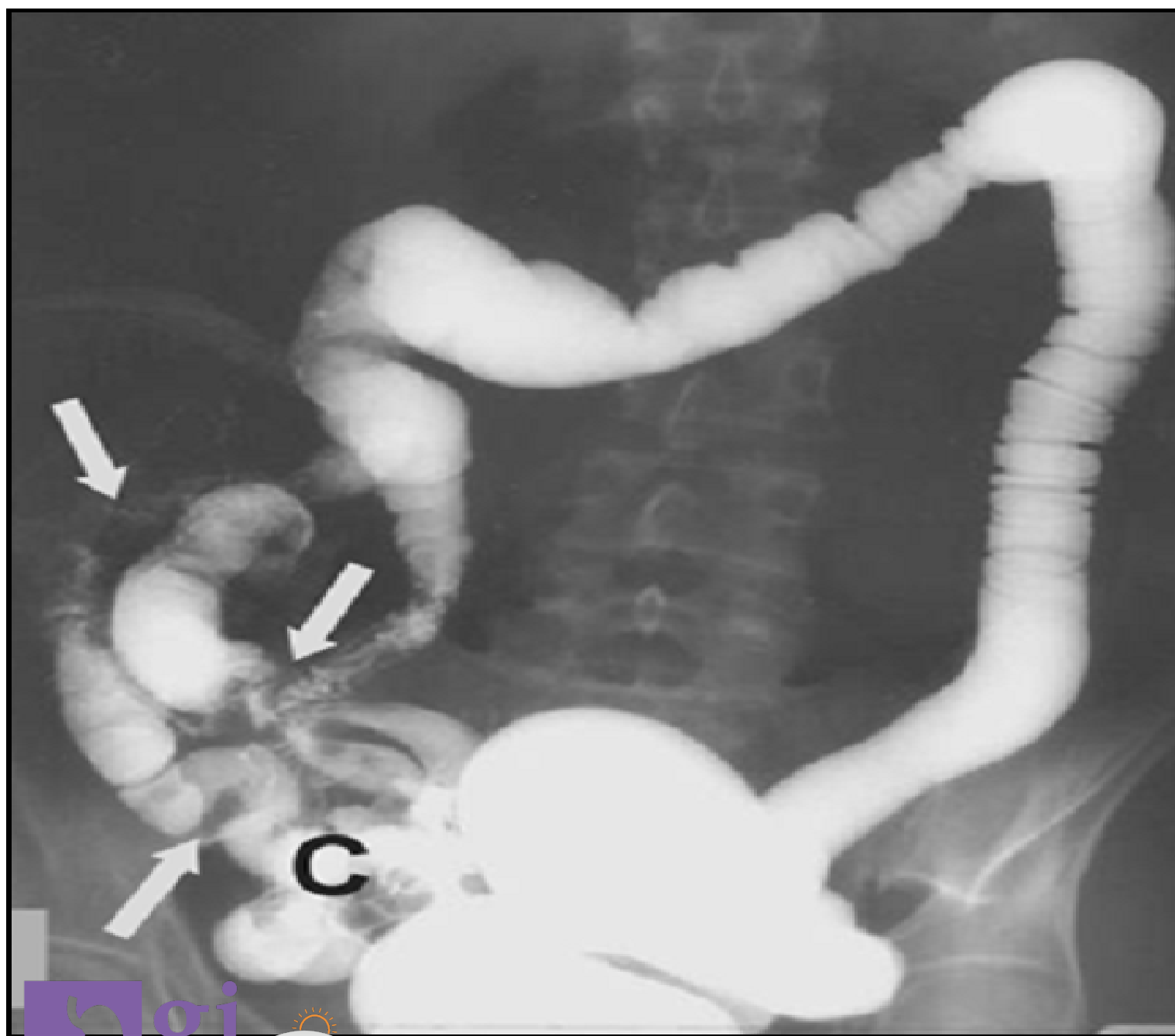


Fig. 7—Diagrammatic illustration of pericecal hernia shows loop of ileum prolapsing (*arrow*) through cecal mesenteric defect, behind and lateral to cecum, into right iliac gutter.



60-year-old man
with right lower quadrant
pain.

Single anteroposterior
radiograph from barium
enema study shows retro-
grade filling of herniated
distal ileum (arrows) as
loops of ileum pass poste-
rior to cecum (C) through
defect of ileocecal
mesentery to reach right
paracolic fossa.

Contrast-enhanced axial CT scan shows loops of small bowel (arrow) posterior and lateral to cecum (asterisk) in right paracolic gutter, producing small bowel obstruction



Foramen of Winslow Hernia (Balindin Hernia)

8 %

Enlarged foramen of Winslow

An abnormally long small-bowel mesentery

Persistence of the ascending mesocolon -mobility of bowel

Elongated right hepatic lobe

Obstructive jaundice

D/D Left paraduodenal hernia

- Encapsulating membrane

- Entry point

- Mass effect on transverse colon

- Prominent congested blood vessels

Herniation of the small bowel (63%)

Herniation of the cecum and right colon (30%)

Herniation of the transverse colon (7%)

Herniation of GB

Preop Diagnosis < 10 %

Reduction-challenging

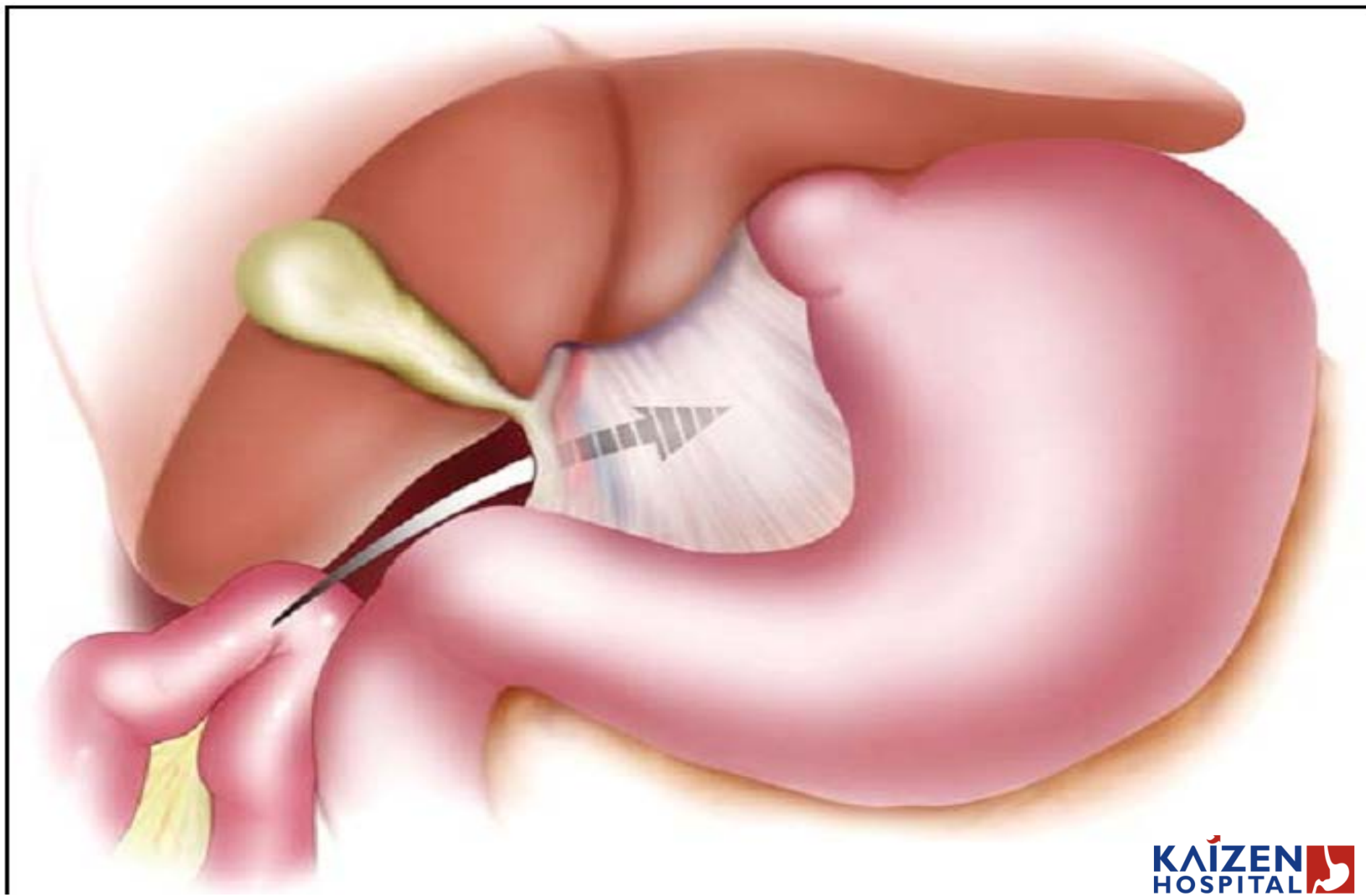
Controlled decompression

Generous Kocherization

No closure of opening

| Hernia Type | Subtype | Incidence | Characteristic Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|--------------------|----------------------------|-----------|--|---|---|--|
| Foramen of Winslow | Congenital normal aperture | 8% | Symptoms of proximal obstruction because of mass effect on stomach; symptom onset often preceded by changes in intraabdominal pressure (i.e., parturition, straining); relief of symptoms with forward bending | Circumscribed loops medial and posterior to the stomach; differential diagnosis of cecal Volvulus | Loops in lesser sac between liver hilum and IVC | None; vessels stretched through foramen of Winslow |

Fig. 9—Graphic illustration of foramen of Winslow hernia shows bowel about to prolapse (*arrow*) into lesser sac, behind hepatoduodenal ligament, the free edge of the lesser omentum.



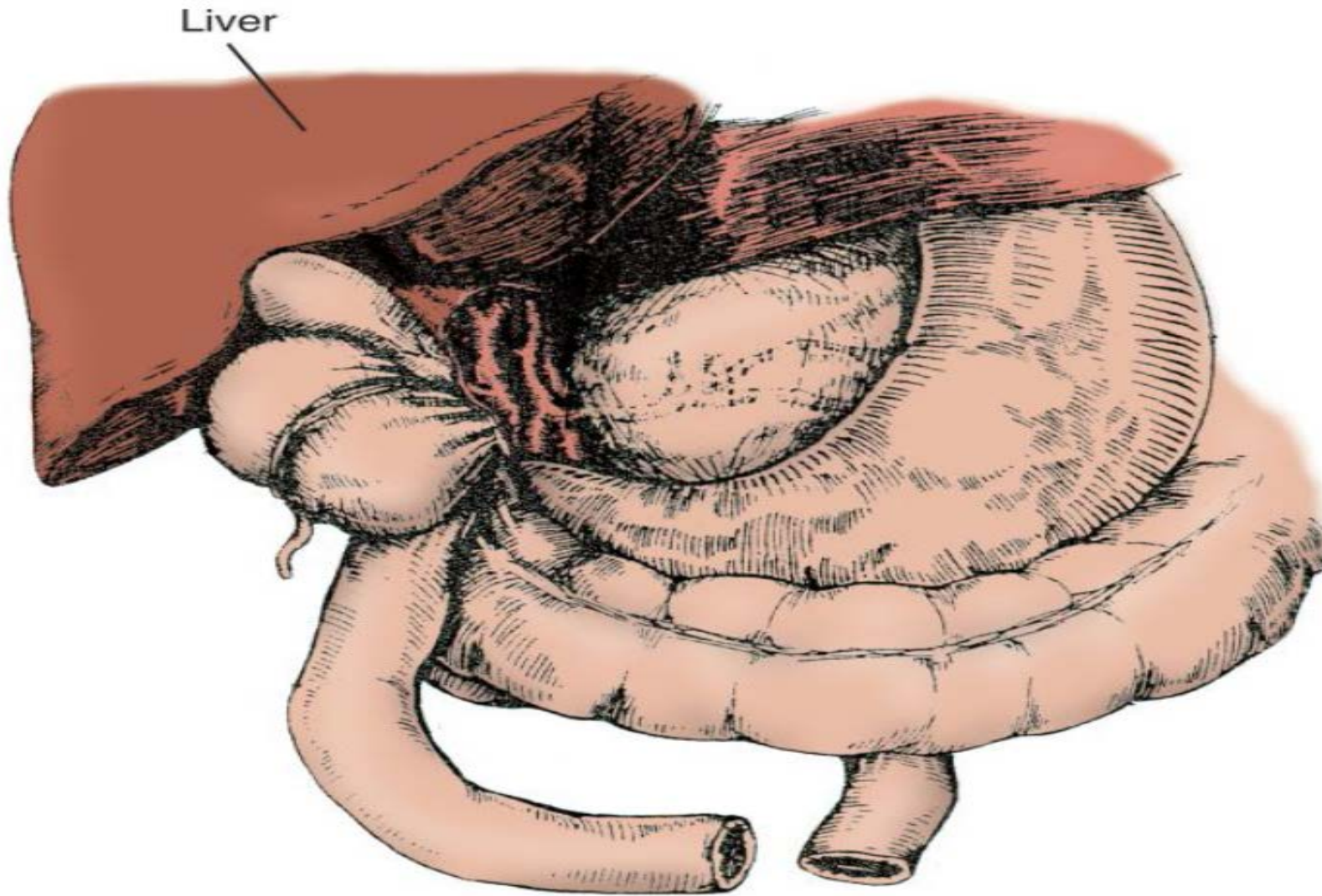
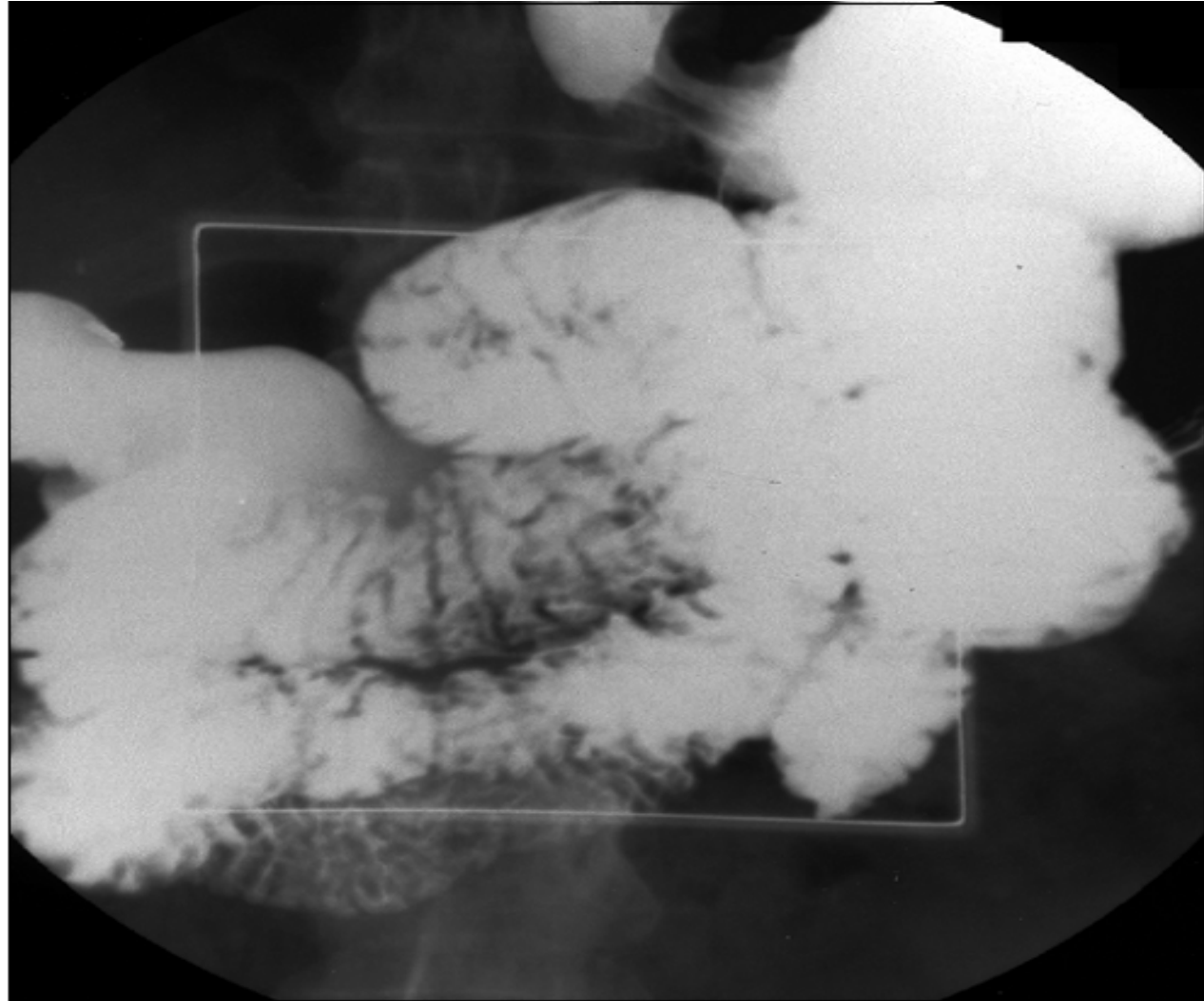
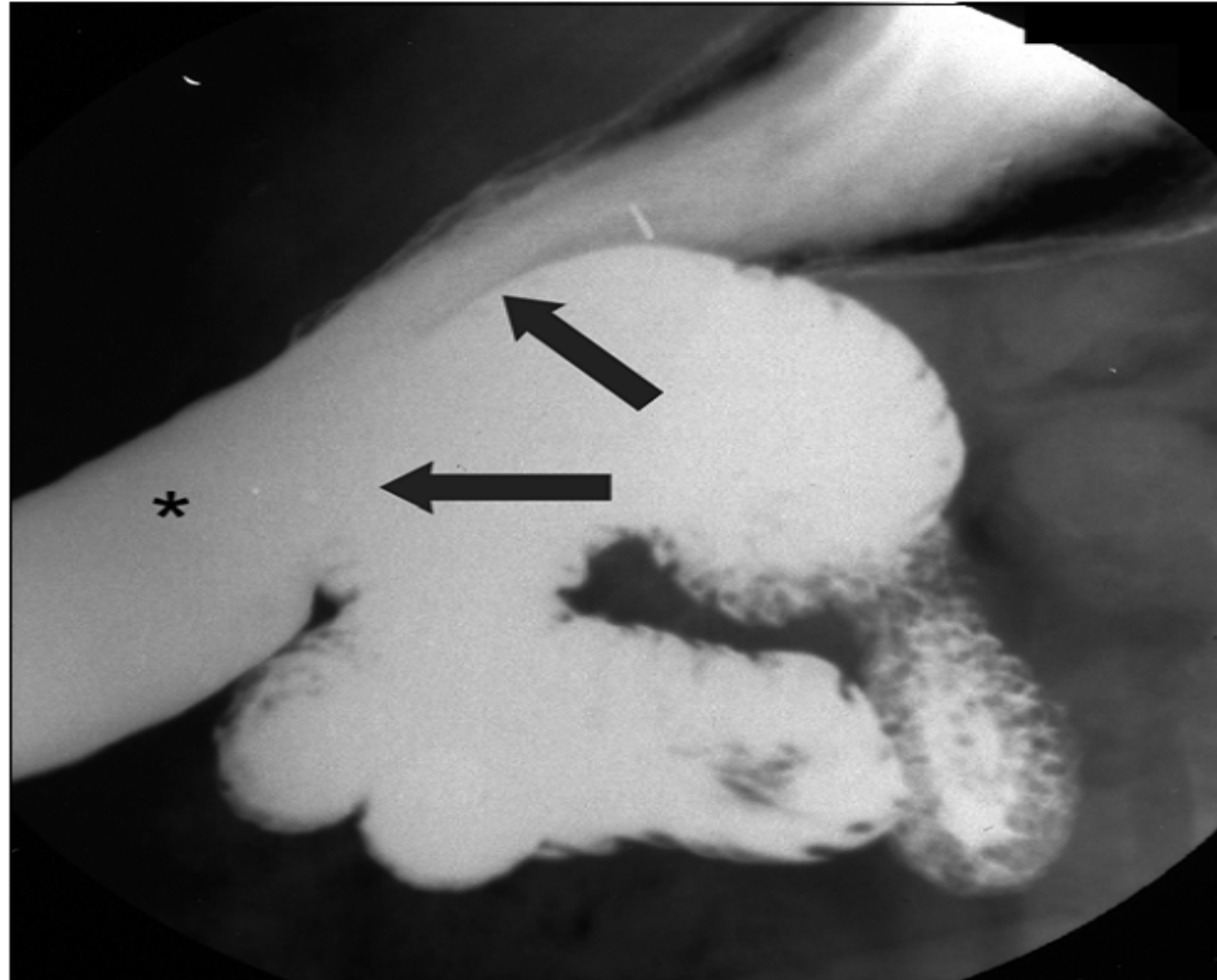


Figure 74-5 Foramen of Winslow hernia. The mobile right colon has been shown to be incarcerated through the opening into the lesser sac. The neck of the sac contains vital structures that must be preserved when repairing these hernias.

54-year-old woman with abdominal pain. Anteroposterior radiograph from upper gastrointestinal series shows abnormal cluster of small-bowel loops located in lesser sac, representing foramen of Winslow internal hernia



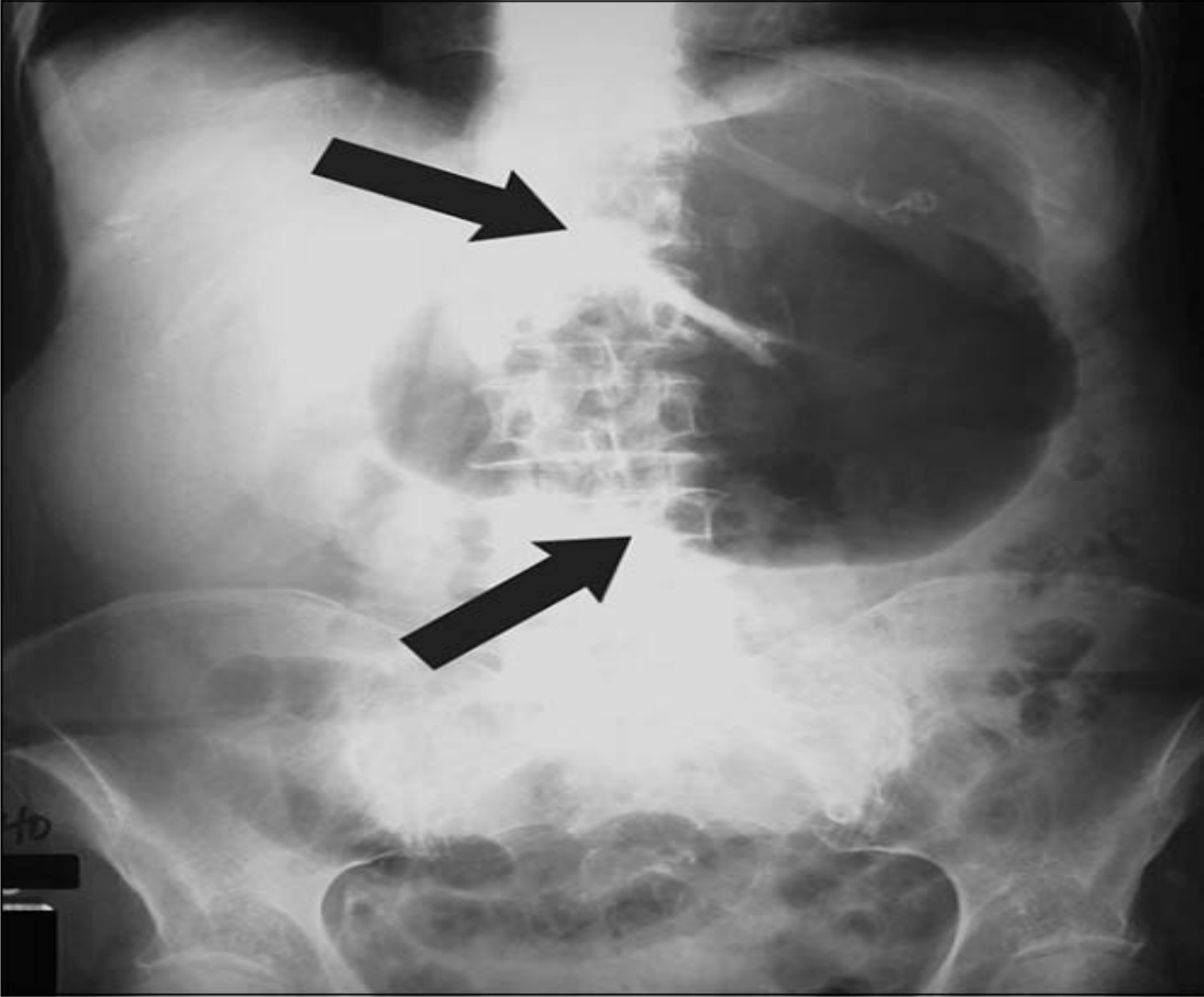
Oblique lateral view from same gastrointestinal series shows abnormal cluster of small-bowel loops posterior to stomach (asterisk), indenting (arrows) and displacing stomach anteriorly



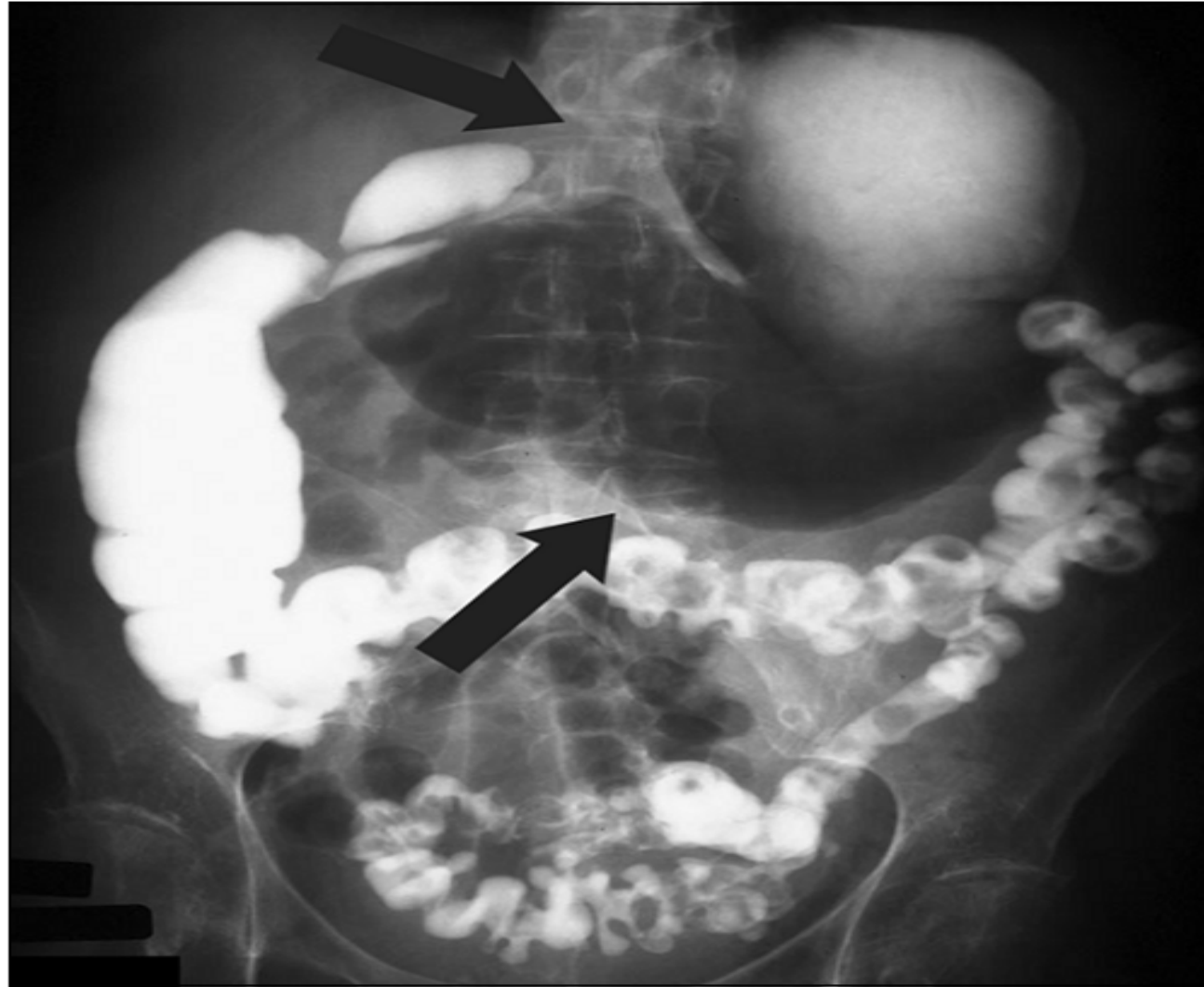
Contrast-enhanced axial CT scan shows cluster of small-bowel loops (arrow) located in lesser sac, posterior to stomach (arrowhead)



70-year-old man with severe epigastric pain. Anteroposterior projection of radiograph shows large collection of gas in left upper quadrant (arrows)



Barium enema (anteroposterior view) shows large, air-filled structure in upper abdomen (arrows), originally thought to represent a distended stomach but surgically confirmed to be cecum involved in foramen of Winslow hernia



Intersigmoid

- Intersigmoid fossa-65%
- Transmesosigmoid
- Intramesosigmoid

| Hernia Type | Subtype | Incidence | Characteristic Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|--------------|---|-----------|----------------------------------|--|--|------------|
| Intersigmoid | Type 1: congenital, normal aperture; types 2 and 3: acquired, abnormal aperture | 6% | None | U- or C-shaped cluster of small bowel posterior and lateral to the sigmoid colon | U- or C-shaped cluster of small bowel posterior and lateral to the sigmoid colon | None |



Fig. 12—Diagrammatic illustration of intersigmoid hernia shows bowel protruding (arrow) through defect in sigmoid mesocolon to lie posterolateral to sigmoid colon itself.

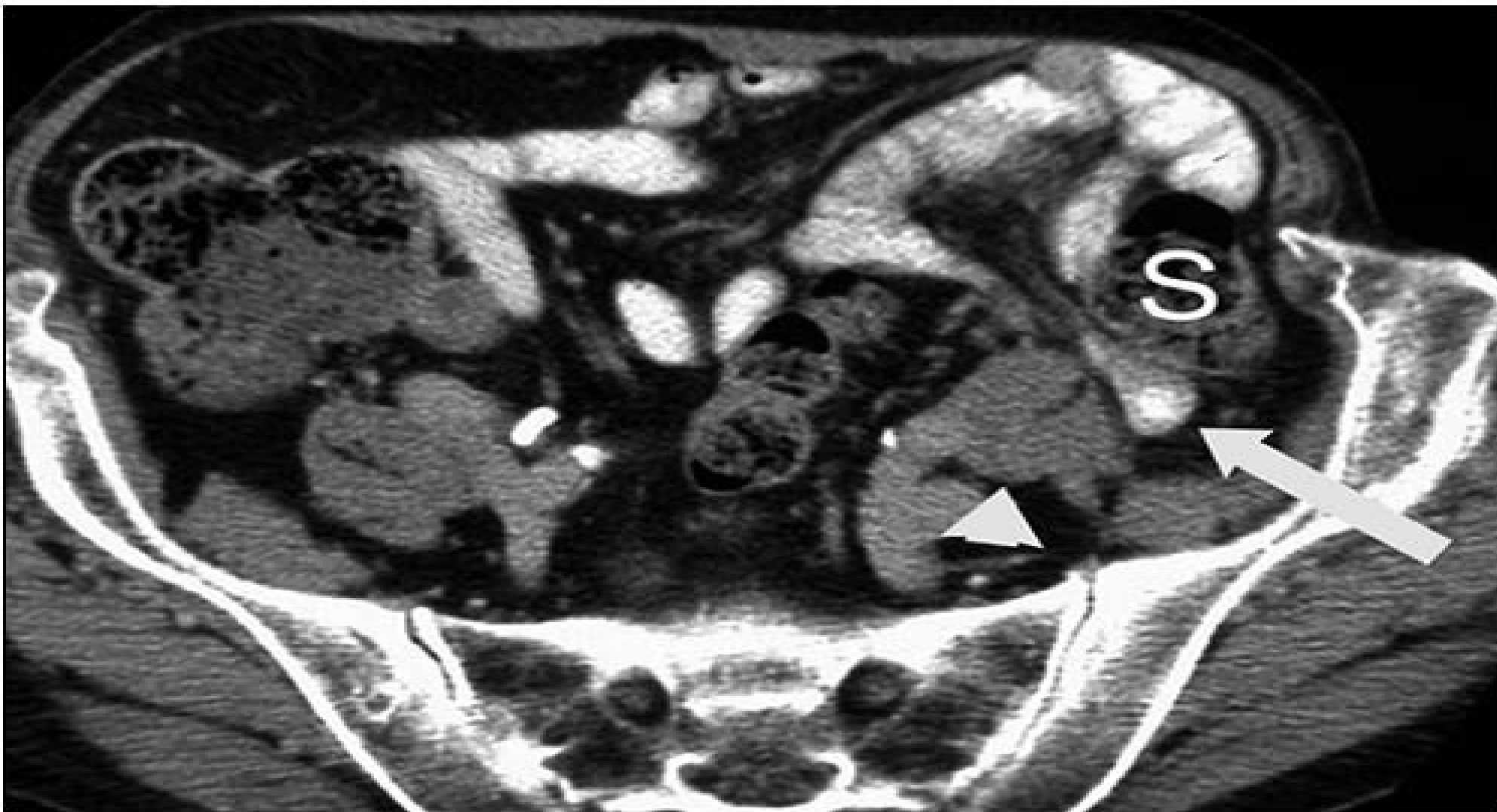


Fig. 13—85-year-old man with abdominal pain. Axial CT scan of sigmoid-related hernia (type 2, transmesosigmoid) reveals small-bowel loops (*arrow*) protruding through defect in sigmoid mesocolon, which usually occurs between left psoas muscle (*arrowhead*) and sigmoid colon (S), to lie posterior and lateral to sigmoid colon itself.

Transmesenteric Hernia

- Bimodal distribution
- Rising trend
- More common in pediatric population-35%
- Prenatal ischemia theory
- Associated with intestinal atresia 5.5%
- Intraperitoneal inflammation
- Trauma
- Partial development regression
- Fenestration of the mesentery by the colon during the embryologic displacement into the umbilical cord

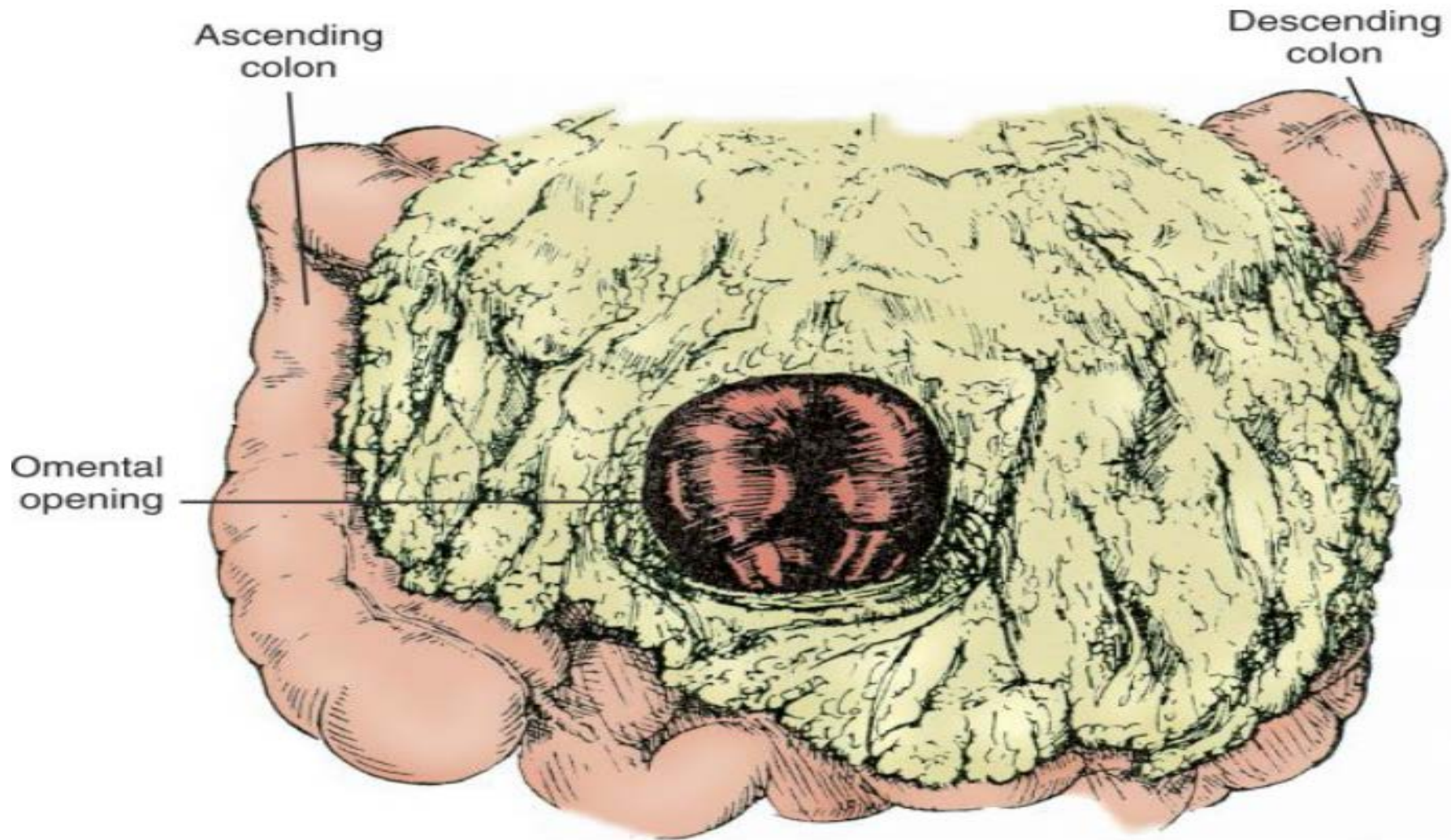


Figure 74-4 Transomental hernia with strangulation of a loop of bowel through the transomental hernia defect. Management consists of simply cutting the constricting ring around the bowel and resection of involved bowel.

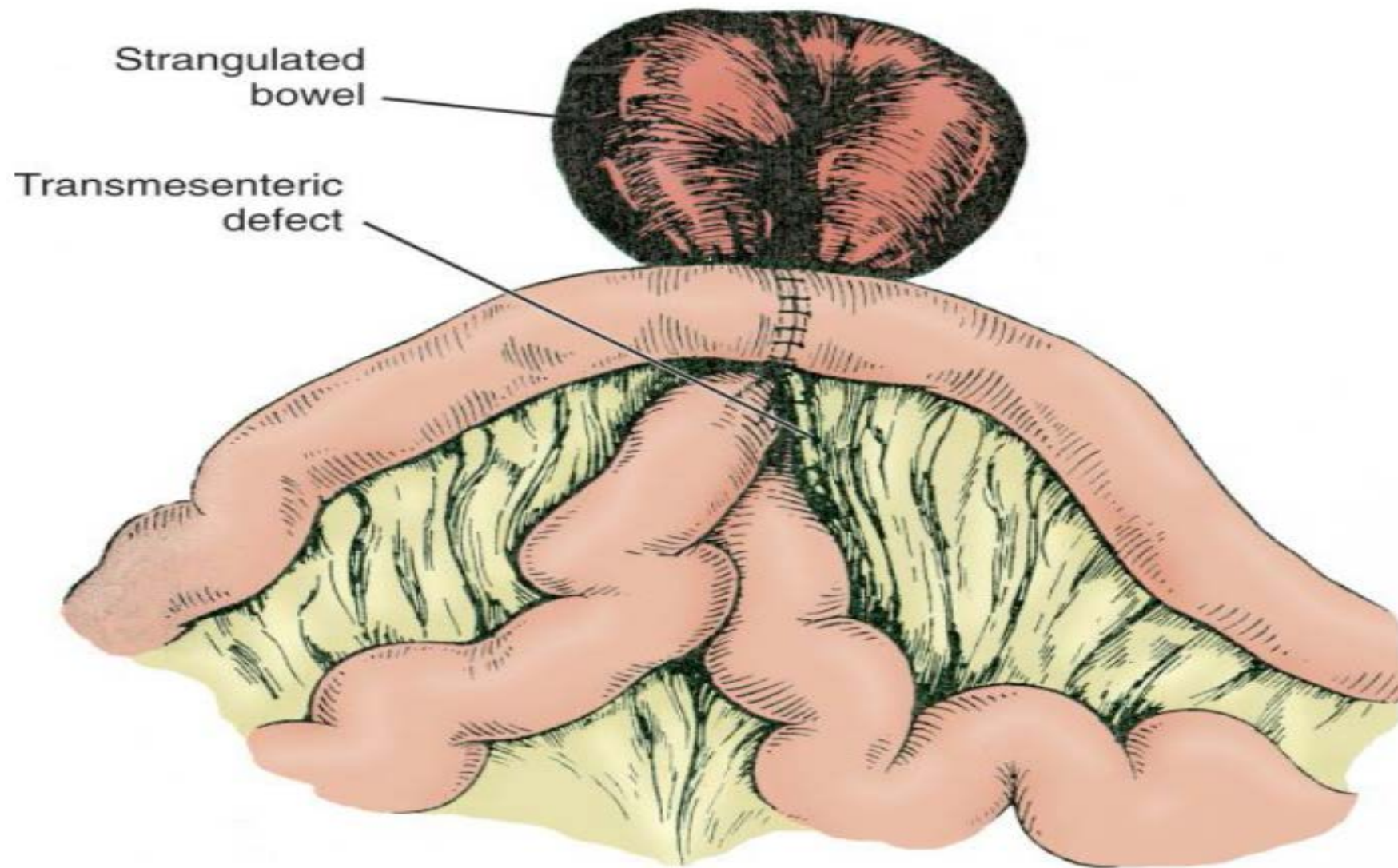


Figure 74-3 Transmesenteric hernia caused by herniation of a loop of small bowel through an unclosed mesenteric defect after small bowel resection.

| Hernia Type | Subtype | Incidence | Characteristic Clinical Findings | Radio- graphy and Barium Studies | CT Findings | Key Vessel |
|----------------------|--|-----------|--|--|---|------------|
| Trans- mesenteric | In children: congenital, abnormal aperture; in adults: usually acquired, abnormal aperture | 8% | Two typical patient populations: children and postsurgical adults; in adults less vomiting because fewer secretions in proximal gastric pouch, onset more acute | Variable, air within gastric remnant; may simulate a left Para- duodenal hernia | Small bowel lateral to colon; displaced omental fat with small bowel directly abutting abdominal wall | None |

- In adults
- Iatrogenic

- Gastric bypass procedures
- Liver transplant

- Choledochojejunostomy

- Antecolic Roux limb
- Laparoscopic approach

Filip JE, Mattar SG, Bowers SP, Smith CD. Internal hernia formation after laparoscopic Roux-en-Y gastric bypass for morbid obesity. *Am Surg* 2002;68:640–643

Three types

- 1) Transmesocolic- 0.7–3.25%
- 2) Transmesenteric
- 3) Peterson's

- Improper suturing
- Suturing incomplete
- Tension and breakdown
- Gradual dilatation
- Rapid weightloss

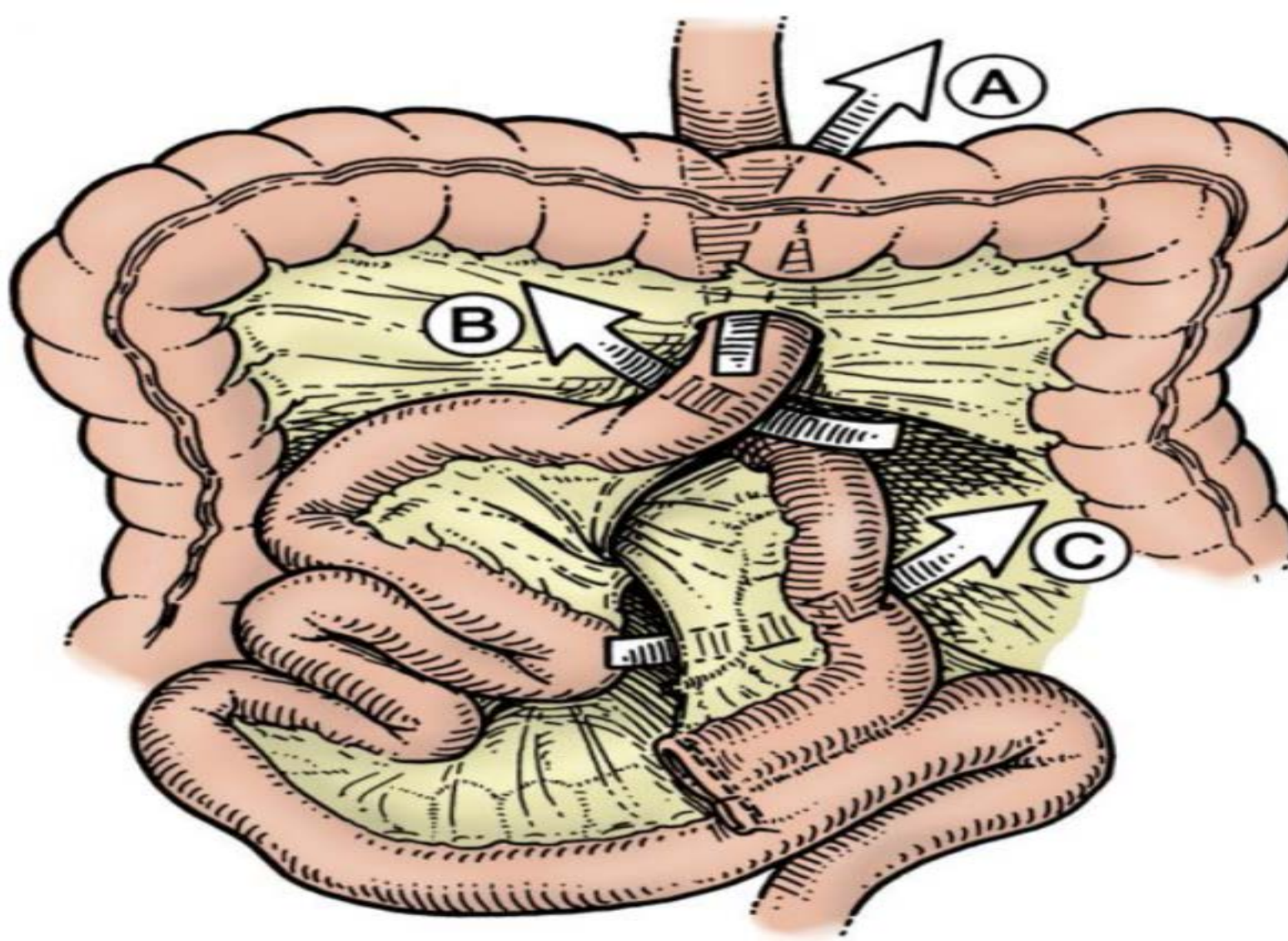


Figure 74-6 Internal hernia after a retrocolic Roux-en-Y gastric bypass. Potential sites of internal herniation of small bowel include the mesocolic mesenteric defect (A), the Petersen defect (B), and the jejunojejunostomy mesenteric defect (C).

Chance of volvulus and strangulation-30%,40 %

Mortality-untreated 100 %

Treated -50%

Small defect and lack of encapsulation

Most (93%) transmesenteric internal hernias in the adult postoperative population occur more than 1 month after surgery (mean, 235days), and the most common cause of obstruction during the first postoperative month is adhesions

Gordian knot of herniated intestine

Blachar A, Federle MP, Pealer KM, Ikramuddin S, Schauer PR. Gastrointestinal complications of laparoscopic Roux-en-Y gastric bypass surgery: clinical and imaging findings. *Radiology* 2002;

223:625–632

Fig. 14—Diagrammatic illustration shows retrocolic Roux-en-Y procedure, with loop of small bowel about to herniate through transverse mesocolon (arrow) at surgically created defect, in keeping with transmesocolic internal hernia.

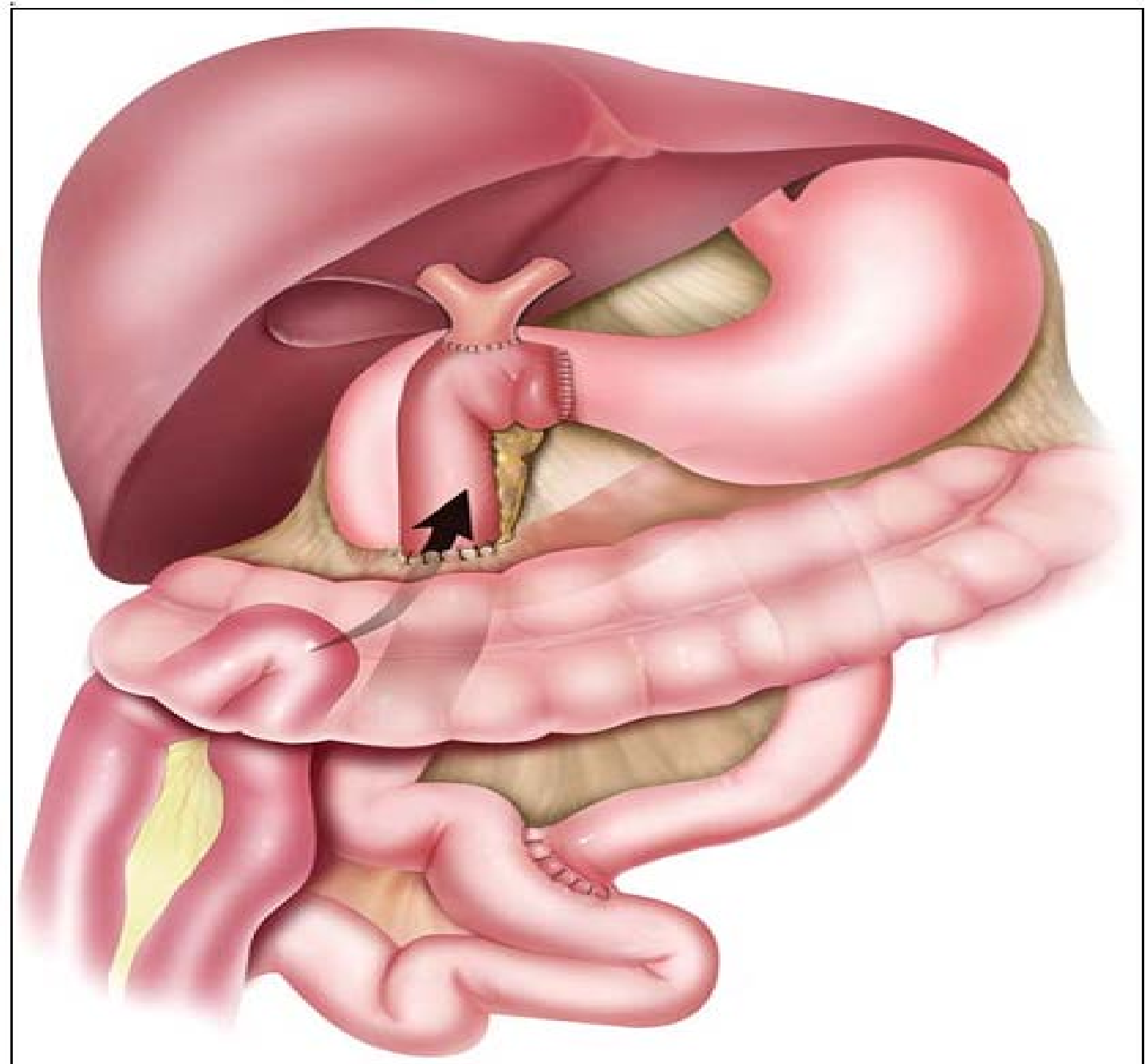


Fig. 15—40-year-old woman with nausea and vomiting. Contrast-enhanced axial CT scan of transmesenteric internal hernia 19 months after Roux-en-Y procedure shows dilated loops of duodenum (*large black asterisk*) and jejunum (*white asterisk*) in expected location of Roux loop. Note that Roux limb (*arrowhead*) is compressed. Straight arrows, curved arrow, and small black asterisk represent colon. (Reprinted with permission from [19])

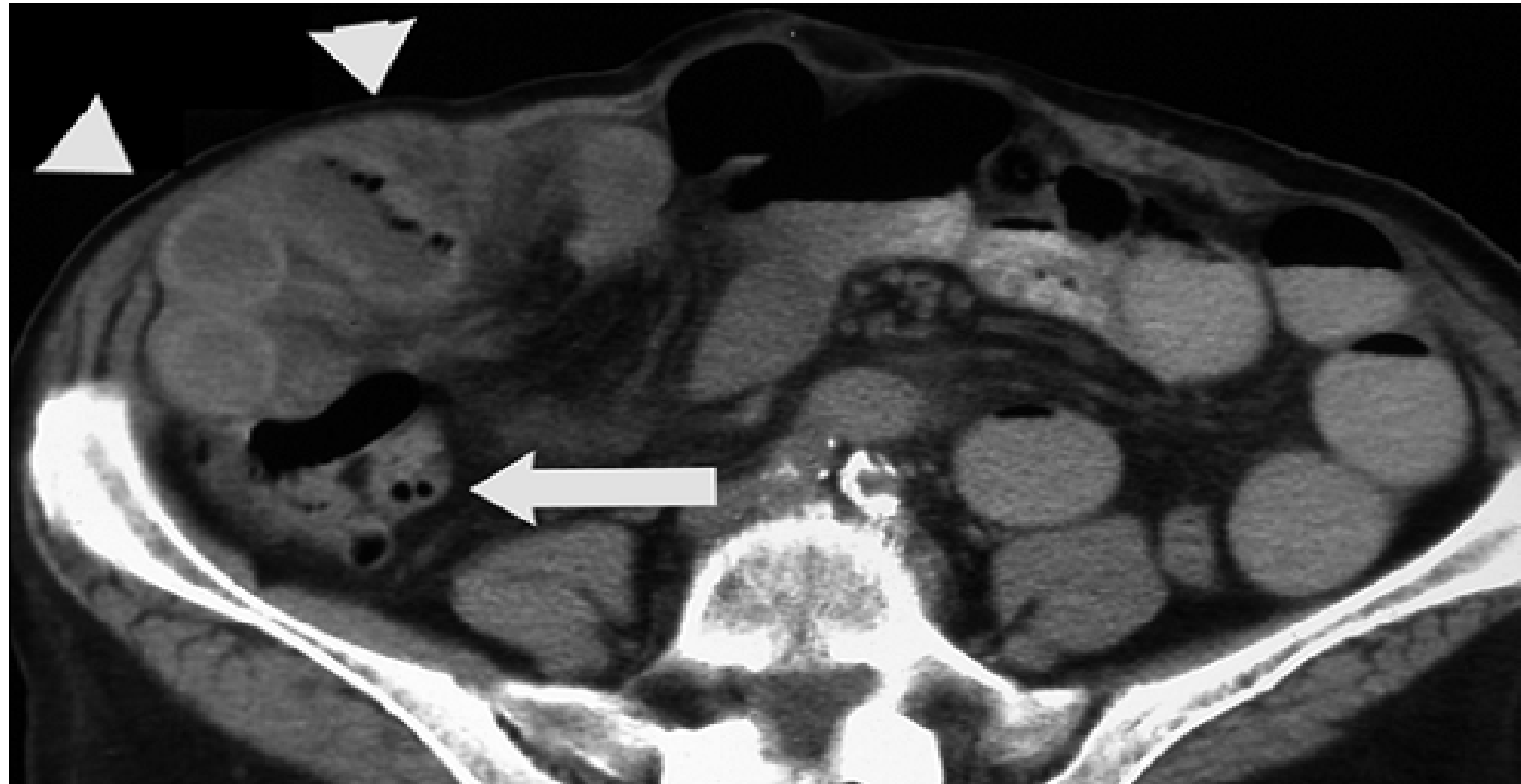




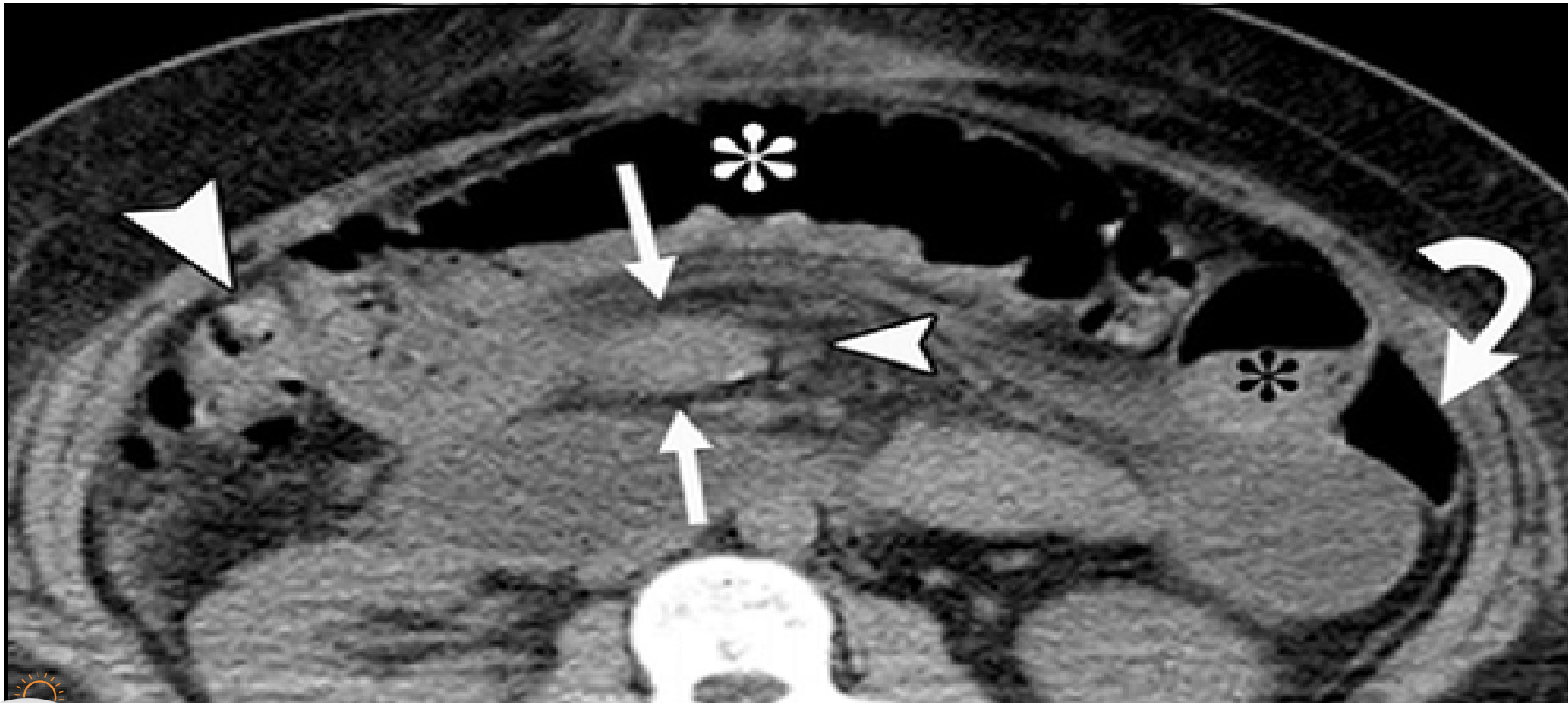
Fig. 16—36-year-old man with sudden onset of abdominal pain. Radiograph (anteroposterior projection) shows distended air-filled gastric remnant, which is normal finding in recently postoperative patient. However, in this patient several months after surgery, this finding is most worrisome for obstruction at distal anastomosis of Roux-en-

CT scans in two different patients with transmesenteric internal hernias.

Contrast-enhanced axial CT scan of 84-year-old woman showing transmesenteric internal hernia after Roux-en-Y procedure shows dilated, fluid-filled loops of small bowel lateral to ascending colon (arrow) and displacing omental fat because loops of bowel lie directly beneath anterior abdominal wall (arrowheads)



Axial contrast-enhanced CT scan at level of transverse mesocolon in a 40-year-old woman shows dilated loop of jejunum directly abutting anterior abdominal wall (white asterisk). In addition, note compression of pancreaticobiliary limb (straight arrows), whereas Roux limb (small arrowhead) is barely visible. Large arrowhead, black asterisk, and curved arrow indicate colon.



Retroanastomotic hernia

Mostly with Roux en Y reconstruction

75 % efferent limb

Antecolic-efferent limb, more common

50 % within 1st month

25 % within 2nd to 12th month

25% after 1 year

| Hernia Type | Subtype | Incidence | Characteristic Clinical Findings | Radio-graphy and Barium Studies | CT Findings | Key Vessel |
|-------------------|-----------------------------|-----------|--|---------------------------------|-------------|------------|
| Retro-anastomotic | Acquired, abnormal aperture | 5% | Usually within the first postoperative month; less vomiting because fewer secretions in the proximal gastric pouch | Variable | Variable | Variable |

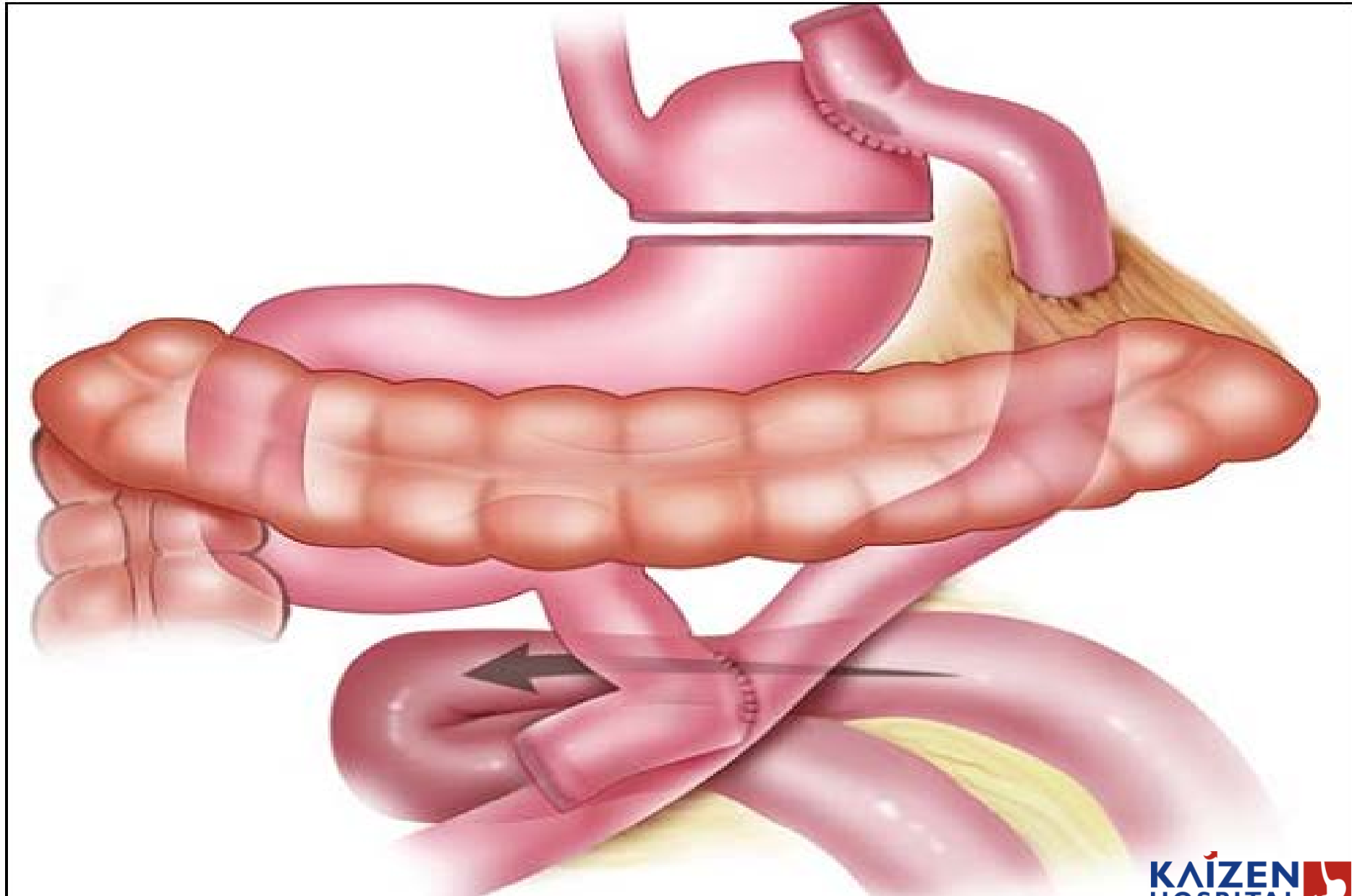
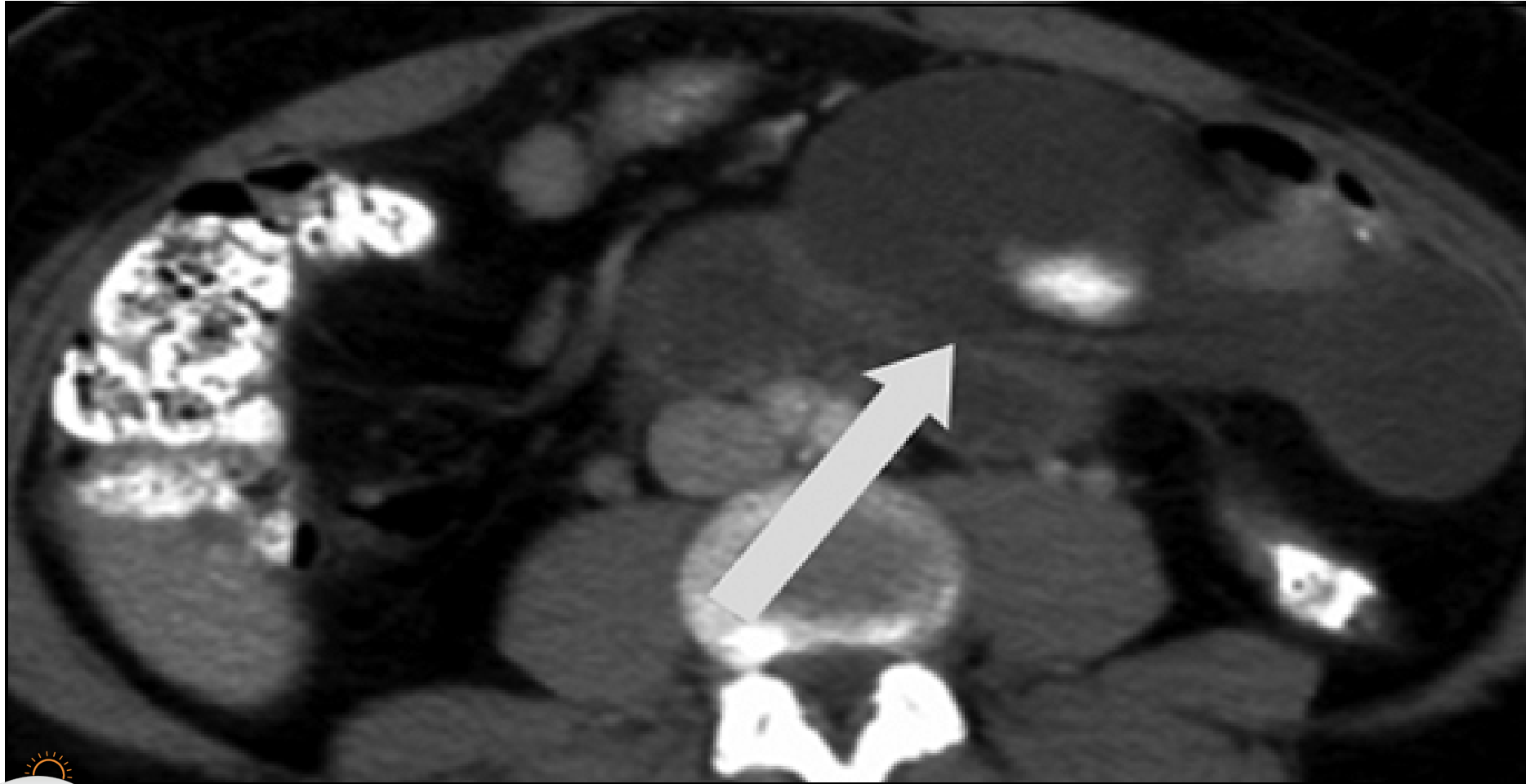
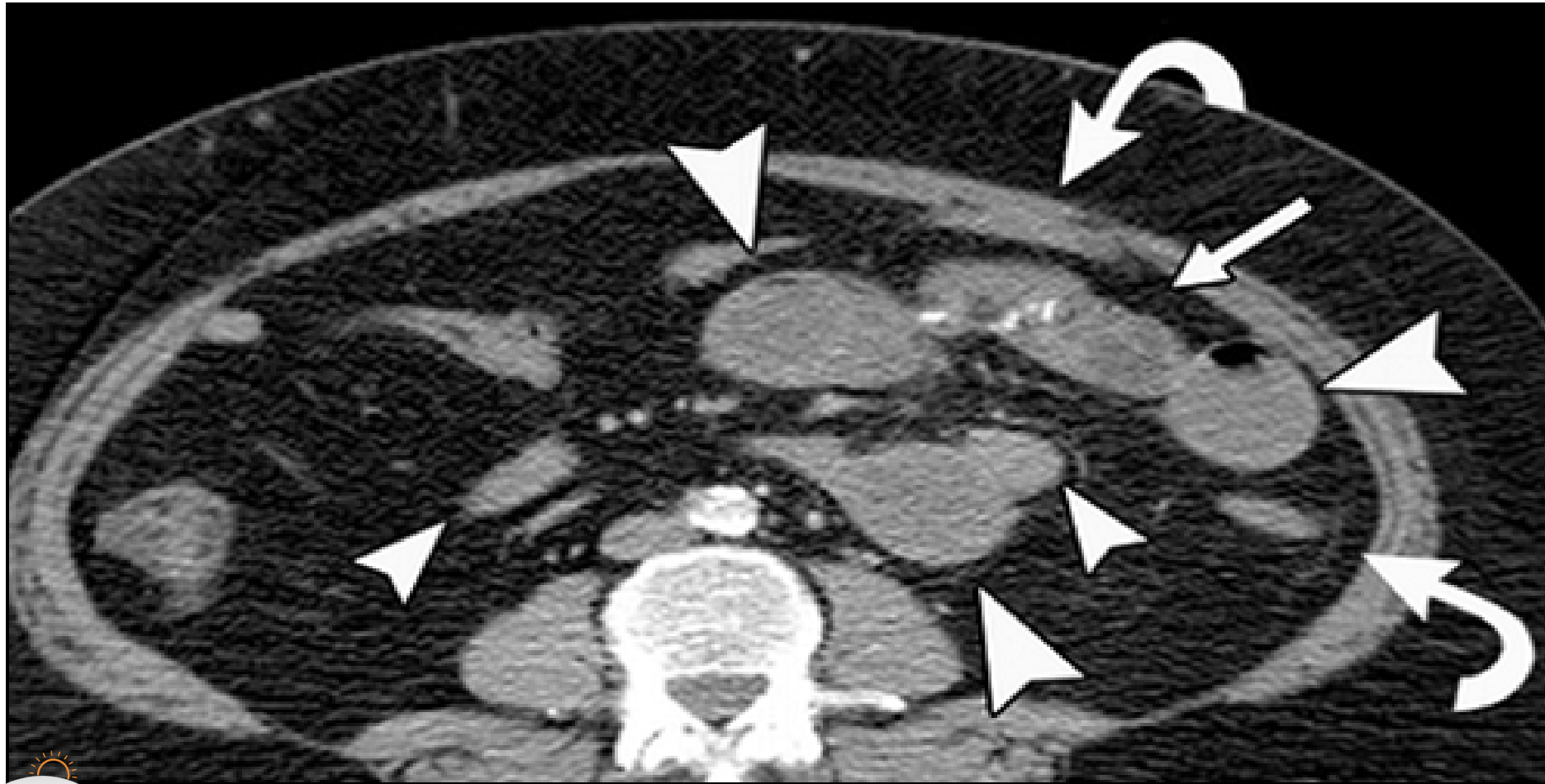


Fig. 18—Diagrammatic illustration shows retrocolic Roux-en-Y gastric bypass procedure. Arrow indicates loop of small bowel protruding posterior to enteroenterostomy, in keeping with a retroanastomotic internal hernia.

CT scans from two different patients showing retroanastomotic hernias.
Contrast-enhanced axial CT scan of retroanastomotic hernia in 35-year-old woman shows loops of dilated fluid-filled small bowel (arrow) in left upper quadrant



Axial CT scan in 58-year-old woman 2 months after Roux-en-Y gastric bypass shows herniated loop posterior to jejunojejunostomy site (straight arrow) and dilated proximal Roux limb (large arrowheads). Note decompressed distal ileal loops (small arrowheads) and colon (curved arrows)



Prevention

Orientation of Roux limb

Antecolic

Quebbemann BB, Dallal RM: The orientation of the antecolic Roux limb markedly affects the incidence of internal hernias after laparoscopic gastric bypass. *Obes Surg.* 15:766 2005

Paravesical hernia

Less than 75 reported cases in literature

Etiology

Inguinal hernia surgery

Urological surgery

Trauma

Primary rare

Male of 50

Posterior supravesical hernia

Thank You !