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SMALL BOWEL TUMORS: A PICTORIAL REVIEW

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EDUCATIONAL POSTER PRESENTATION



LEARNING OBJECTIVES

- To illustrate and describe the main imaging features of **small bowel tumors** in different imagiologic methods, mainly in Multi-Detector Computed Tomography (MDCT) and CT enterography.

BACKGROUND

- Neoplasms of small bowel are rare lesions, accounting for 3-6% of gastrointestinal tumors.
- Symptoms are frequently nonspecific:
 - abdominal pain
 - weight loss
 - gastrointestinal bleeding
- Early diagnosis can be a diagnostic challenge.

CT ENTEROGRAPHY

- Optimal imaging technique for detection of small bowel tumors, evaluates:
 - the features of the lesion (Figure 1);
 - the extent of disease;
 - related complications, such as obstruction, intussusception and fistulas.

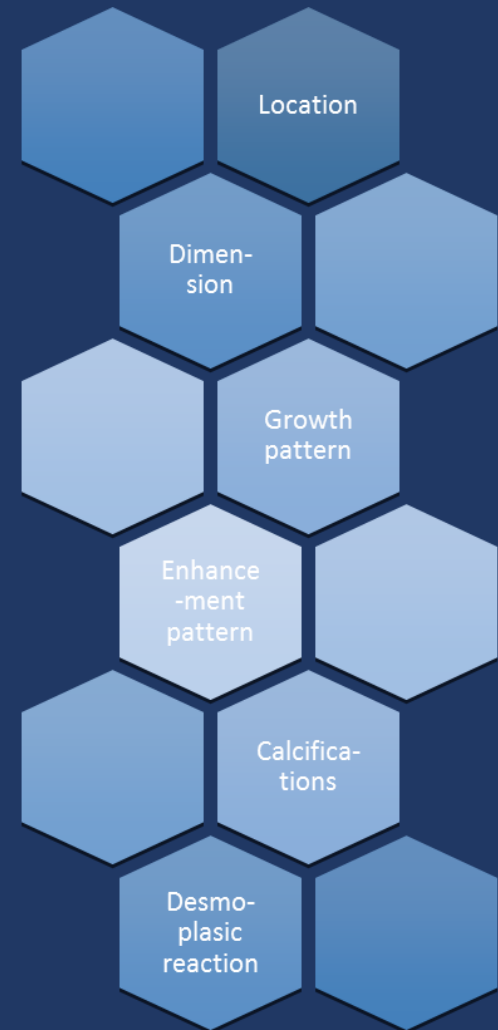


Figure 1 - Different characteristics evaluated on CT enterography

CT ENTEROGRAPHY TECHNIQUE

- 6 h fasting
- 1h before: 1,5 l of a negative oral contrast agent
- Scan with IV contrast: arterial and/or venous acquisition
- Multiplanar reformatting images

Adequate luminal distension is fundamental.

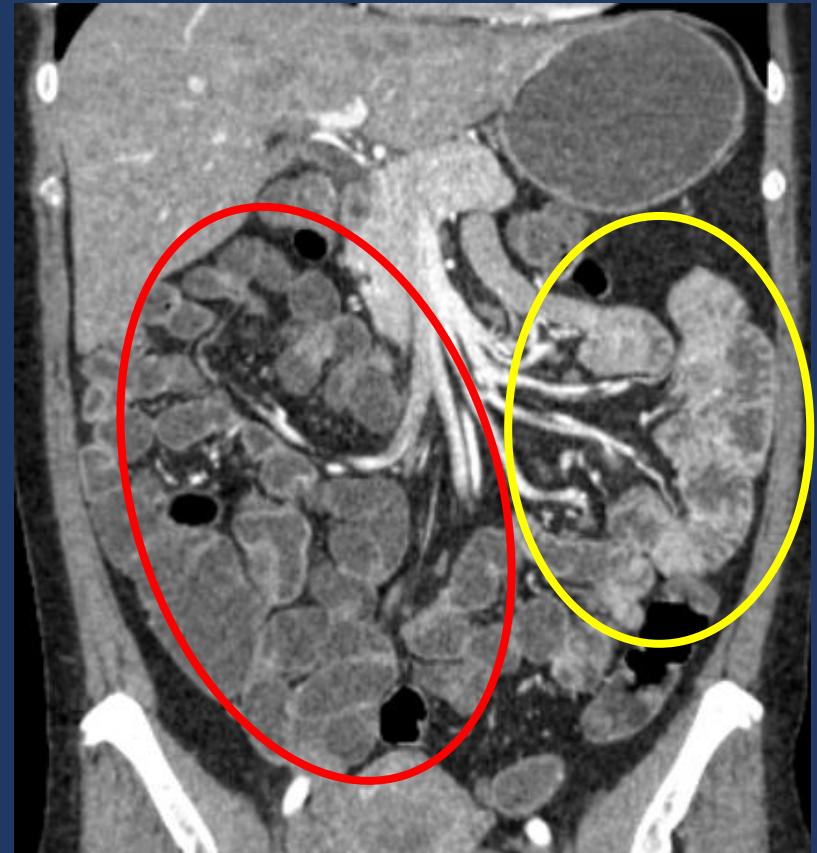


Figure 2- Coronal CT enterography showing the normal aspect of the small bowel. Note that jejunal loops (yellow circle) have more valvulae conniventes than ileal loops (red circle).

SPECTRUM OF SMALL BOWEL LESIONS

The differential diagnosis of small bowel lesions is **extremely wide**, ranging from benign to malignant diseases:

Benign tumors:

- Adenoma
- Lipoma
- Leiomyoma
- Gastrointestinal Stromal Tumor (GIST)

Malignant tumors:

- Carcinoid tumor
- Adenocarcinoma
- Lymphoma
- Malignant GIST

- Benign polypoid tumors of mucosa glandular tissue.
- Small, homogeneous intraluminal lesions extending from the bowel wall.
- More often multiple in genetic syndromes (Familial Adenomatous Polyposis, Gardner and Turcot syndromes).

CT IMAGING FEATURES:

- ✓ Soft tissue polypoid lesion with smooth borders within the bowel lumen
- ✓ Can be sessile or pedunculated

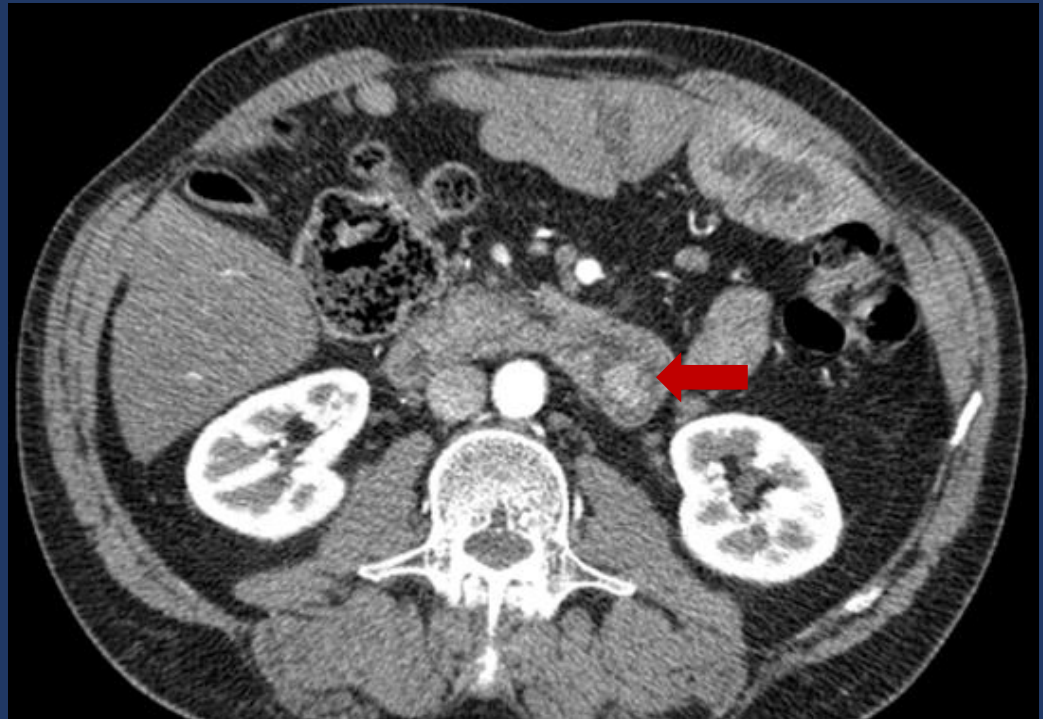


Figure 3 - Contrast-enhanced CT shows an adenoma (arrow) in duodenum.

HAMARTOMATOUS POLYP

- Polypoid lesions more often related with Peutz-Jeghers syndrome, that is characterized by mucocutaneous pigmentation and hamartomatous polyps of the gastrointestinal tract, predominantly in the small intestine.

CT IMAGING FEATURES:

- ✓ Multiple broad-based polyps within the small bowel lumen, which may be clustered or scattered
- ✓ Variable size

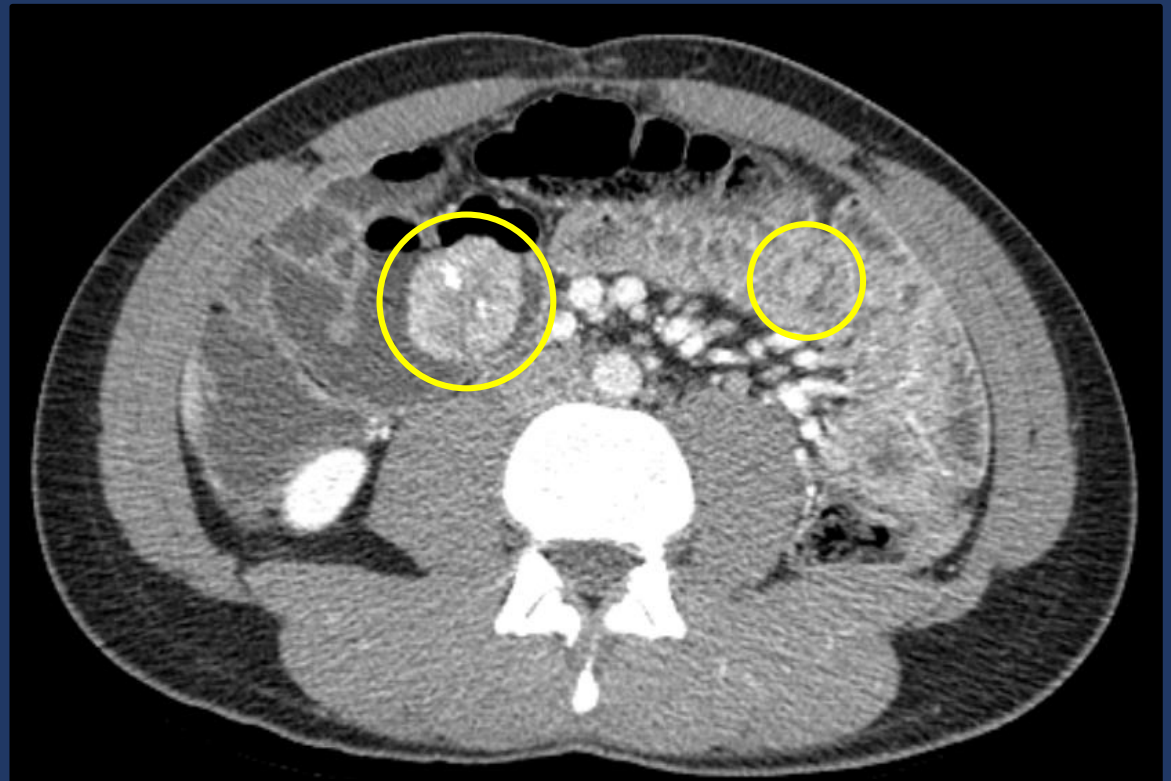


Figure 4 – CT enterography shows two polyps in small bowel (circle), the largest localized in ileum, in a patient with Peutz-Jeghers syndrome.

- Mature adipose tissue proliferation that arise in the submucosa of the bowel wall.
- Mostly are located in the **ileum**.
- Usually asymptomatic, but can act as a lead point for intussusception.

CT IMAGING

FEATURES:

- ✓ Well-circumscribed lesion containing uniform fat attenuation

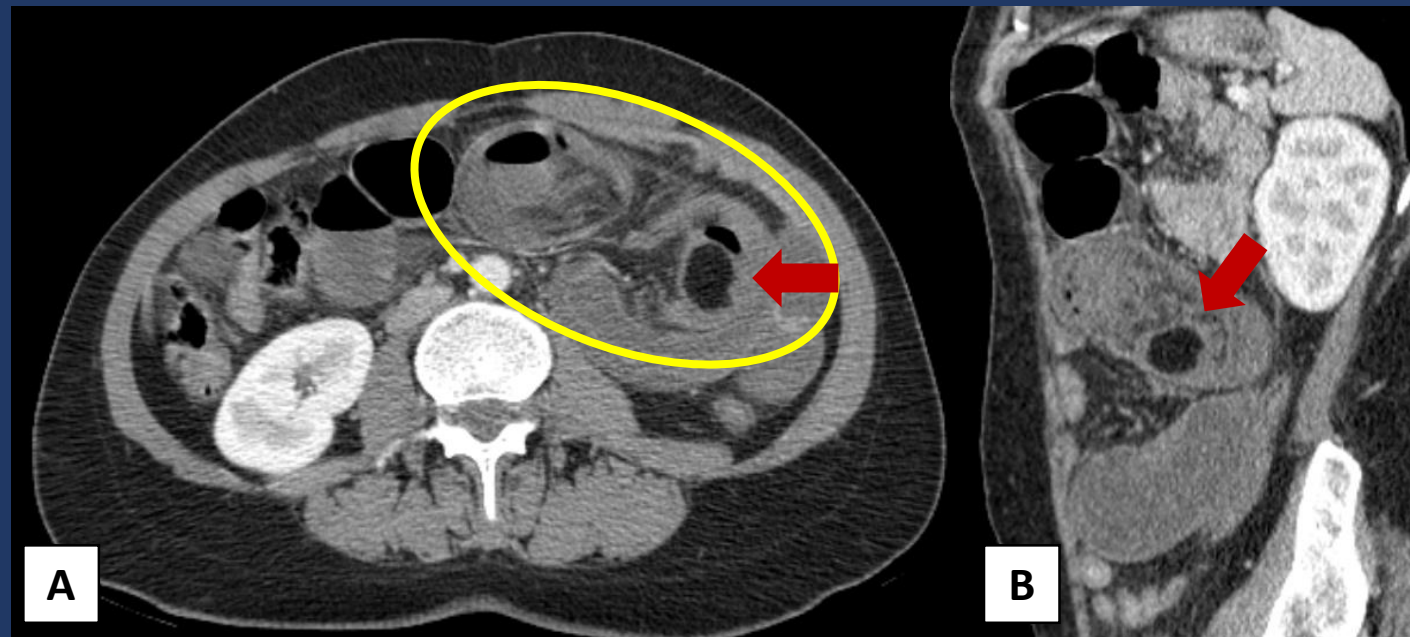


Figure 5 – Axial (A) and coronal (B) contrast-enhanced CT demonstrates an ileal **lipoma** (arrow) acting as lead point for **intussusception** (circle).

- Most common small bowel mesenchymal neoplasm.
- 9% of all small bowel tumors.
- Most often **duodenal**, less commonly found in more distal GI tract.
- Most GISTs are benign.

CT IMAGING FEATURES:

- ✓ Well-marginated
- ✓ Predominantly exophytic growth, an intraluminal mass is less common
- ✓ Heterogeneous enhancement
- ✓ Can show necrosis, hemorrhage, calcification or fistulization

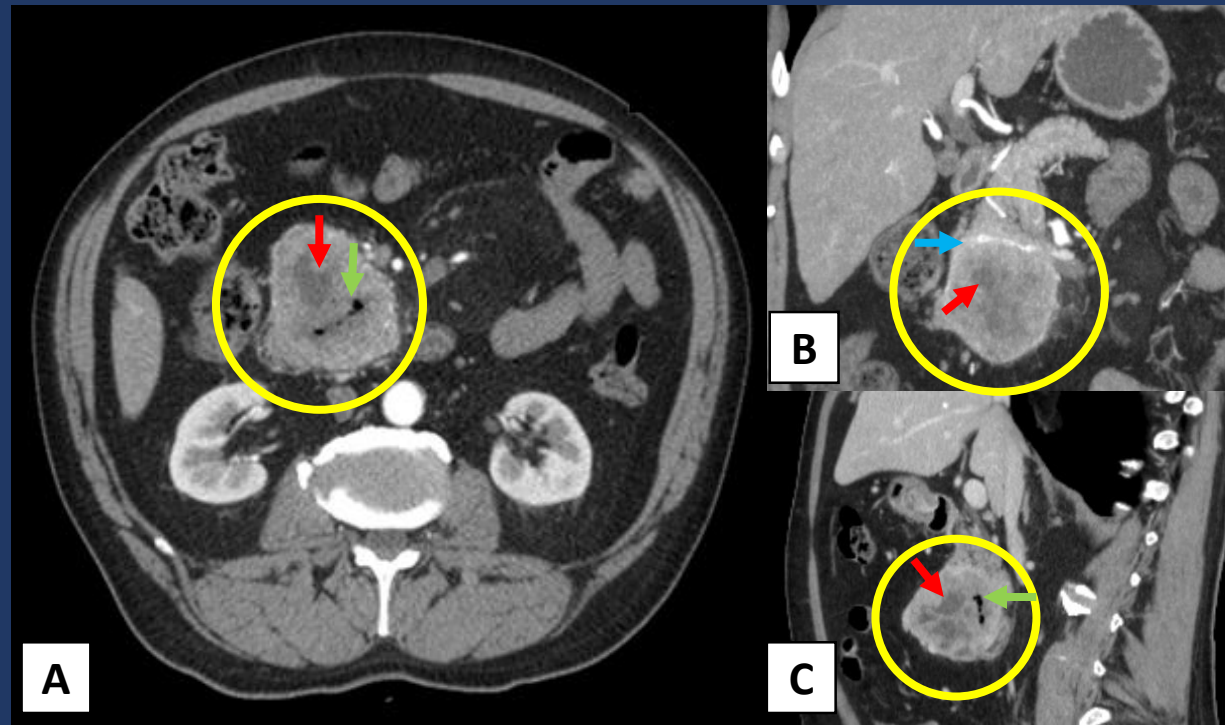


Figure 6 - Axial (A), coronal (B) and sagittal (C) contrast-enhanced CT shows an **duodenal exophytic mass** (circle) with **peripheral calcification** (blue arrow) and **heterogeneous enhancement**, with **central necrosis** (red arrow) and **central air** (green arrow) suggesting fistulization, typical findings in a GIST.

- Malignant GISTs are most common in the distal small bowel.
- Imaging methods are not very useful to determine if a lesion is benign or malignant.

Findings suggesting malignancy:

- Larger size (>5 cm)
- Local invasion
- Distant metastases



Figure 7 - Contrast-enhanced CT shows a **intraluminal hypervascular lesion** (arrow) in the duodenal wall, that revealed to be a benign GIST.



Figure 8 - Contrast-enhanced CT shows an **exophytic and heterogeneous mass** in an ileal loop, with central necrosis (asterisk), that revealed to be a malignant GIST.

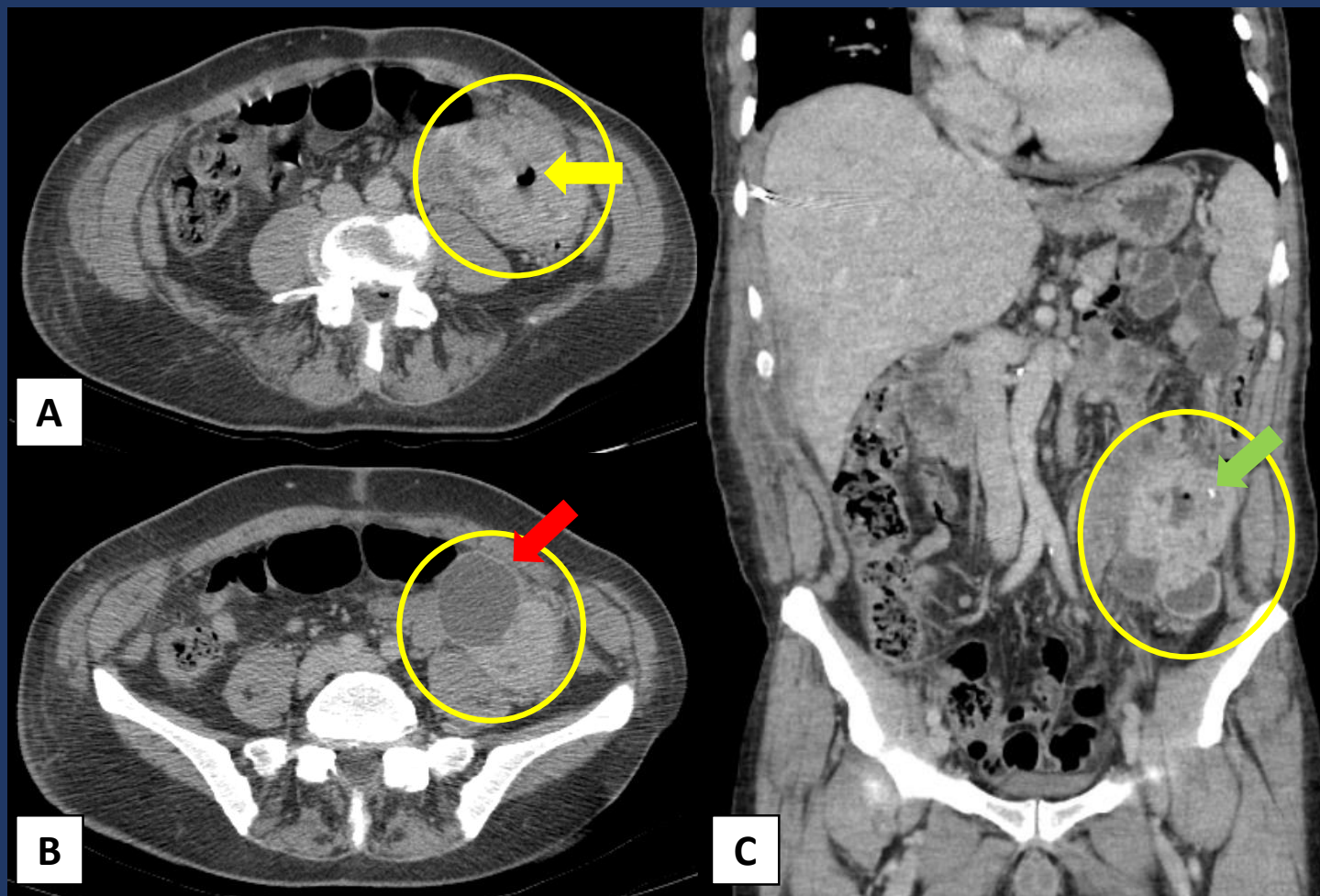


Figure 9 – Axial (A, B) CT shows an **exophytic mass** (circle) in the dependence of a jejunal loop, with heterogenous contrast uptake, **central gas** (yellow arrow) and **adjacent cystic components** (red arrow). In the coronal (C) CT scan there is a **small calcification** inside the lesion (green arrow). These aspects are suggestive of GIST, which was confirmed after surgical resection.

- Well-differentiated neuroendocrine tumor.
- 35-42% of small bowel malignancies.
- Most often occur in the **ileum** (90%), followed by the jejunum.
- Typically exhibits invasive growth and peripheral fibrotic reaction (desmoplastic reaction)
- Carcinoid metastases to the liver are typically hypervascular.

<10% have carcinoid syndrome

CT IMAGING FEATURES:

- ✓ Primary lesion: small submucosal hyperenhancing lesion (polypoid or plaque-like) or large intraluminal lesion with ulceration
- ✓ Mesenteric extension: ill-defined mesenteric mass with spiculated margins, often with calcifications. The desmoplastic reaction causes retraction, kinking and angulation of bowel.

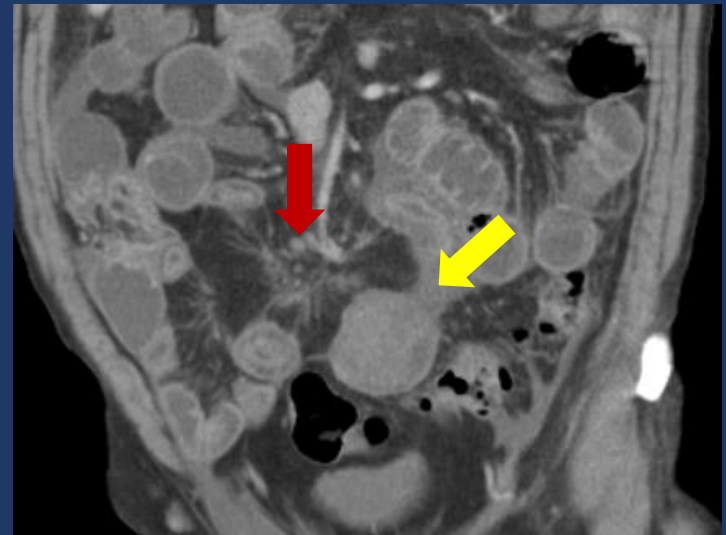


Figure 10 – Coronal CT image showing a **intraluminal soft tissue lesion** (yellow arrow) with retractor desmoplastic fibrosis in adjacent mesentery (red arrow).

PRIMARY LESION

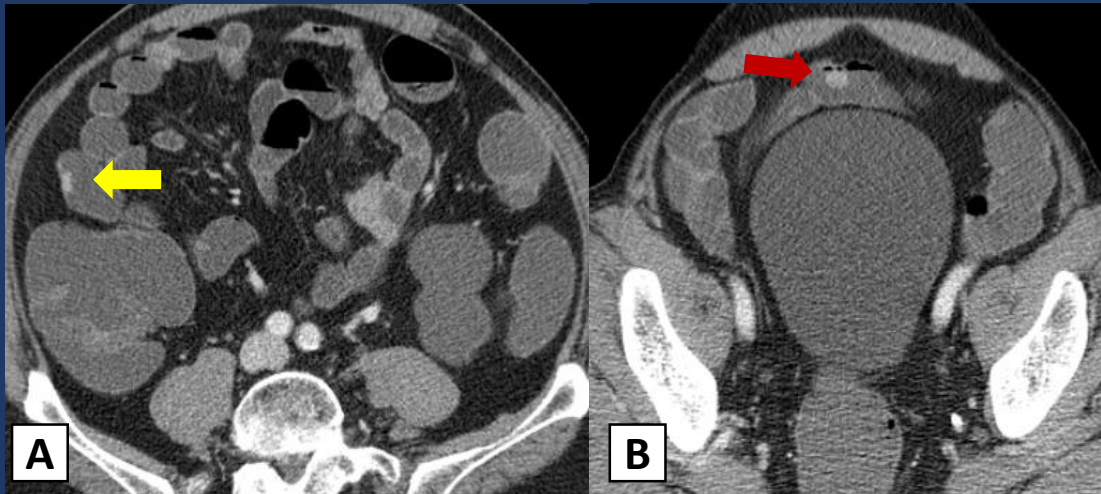


Figure 11 – Axial images of CT enterography (A, B) shows a small **hyperattenuating plaque-like lesion** (yellow arrow) and a **polypoid lesion** (red arrow) in the ileum. The histological analysis after ileal resection and polypectomy revealed carcinoid lesions.



Figure 12 – Coronal CT enterography shows a small **hyperattenuating plaque-like lesion** (arrow) in the ileum, which was a carcinoid.

PRIMARY LESION WITH MESENTERIC EXTENSION

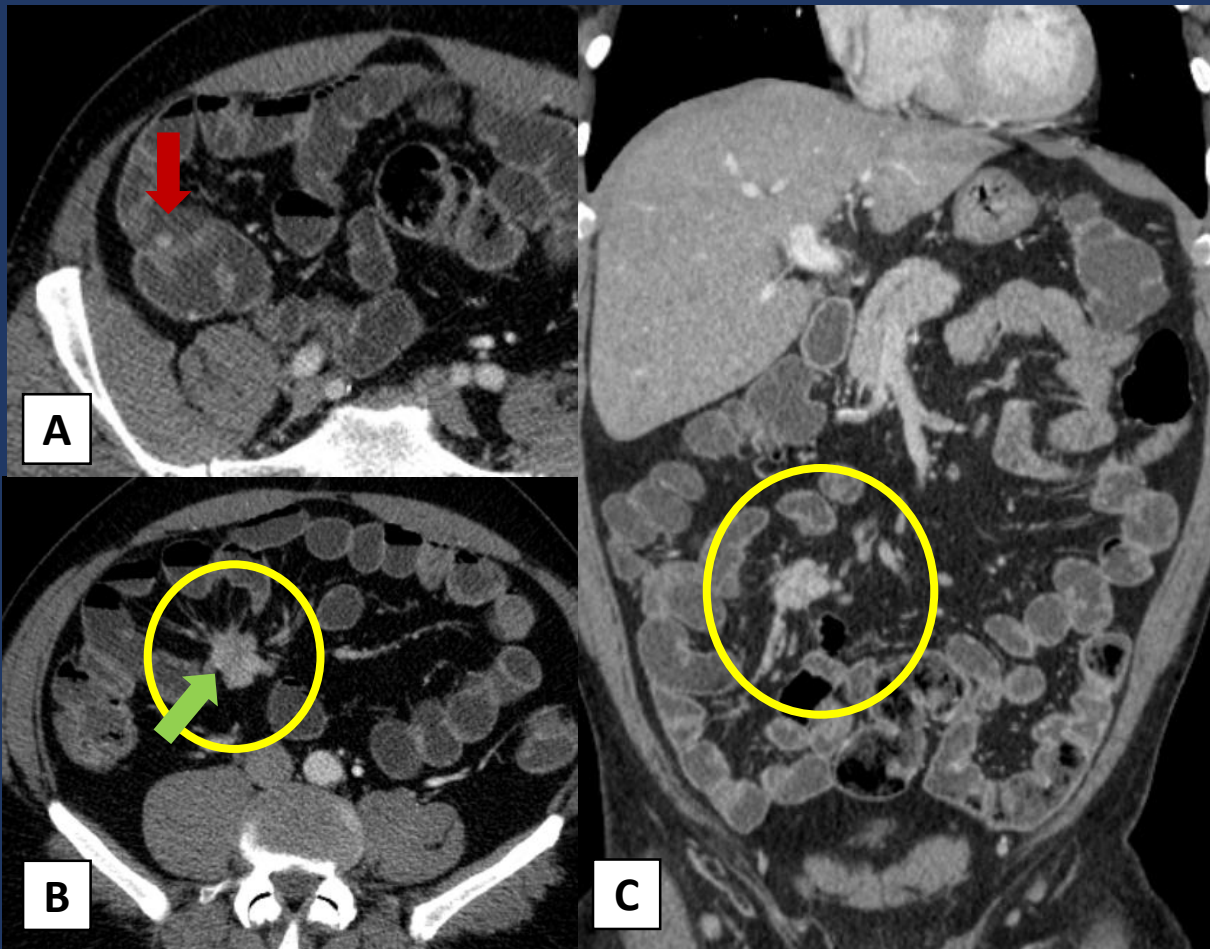
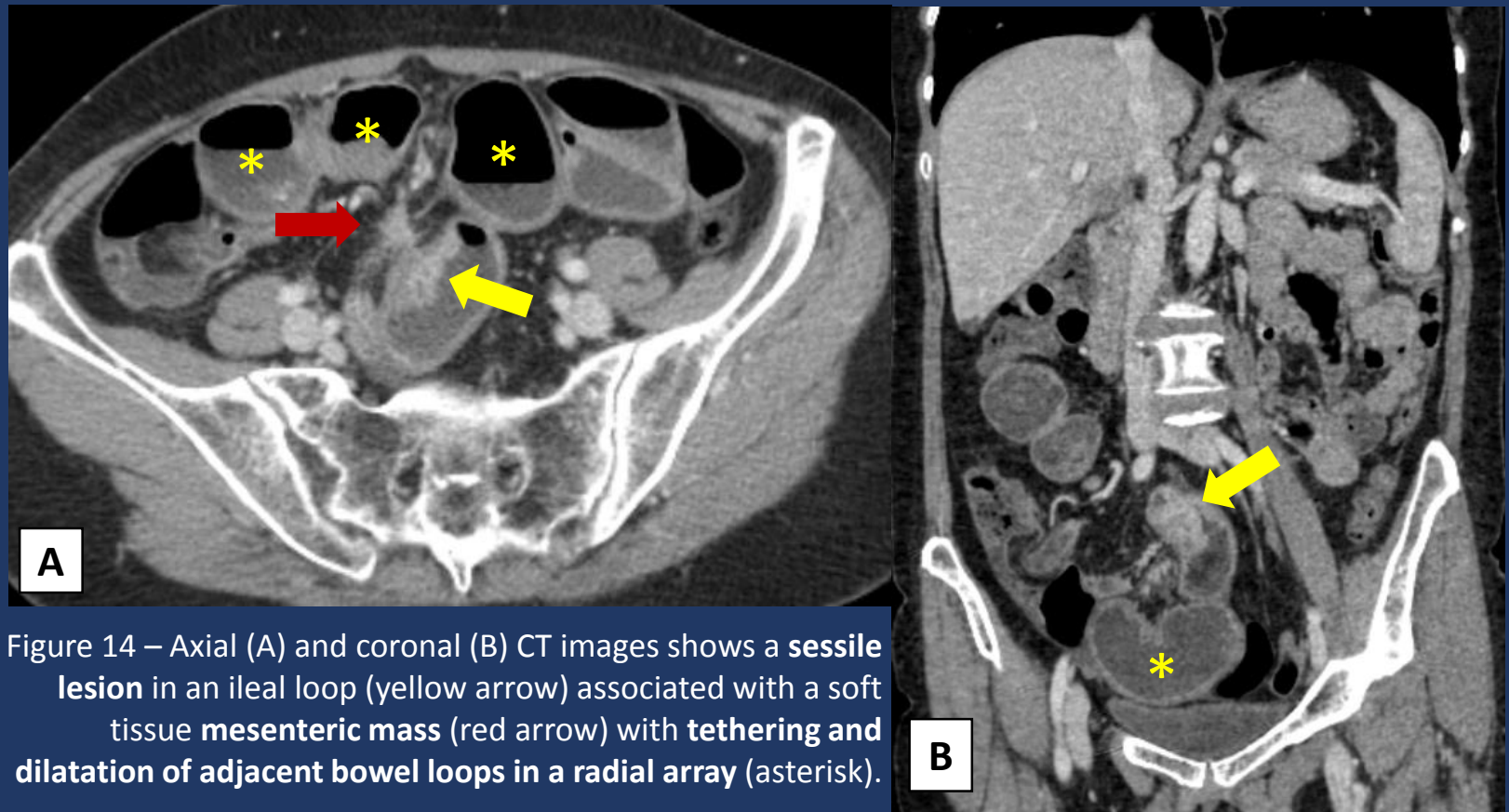


Figure 13 - Axial (A, B) and coronal (C) CT enterography shows a **small hyperenhancing polyp** (red arrow) and a **mesenteric mass** (circle) with small foci of calcification (green arrow) within it and the surrounding desmoplastic reaction.

PRIMARY LESION WITH MESENTERIC EXTENSION



ADENOCARCINOMA

- 30-40% of small bowel malignancies.
- 50% arise in the **duodenum**, most commonly in the region of the ampulla of Vater.
- Commonly causes partial or complete small bowel obstruction.

CT IMAGING FEATURES:

- ✓ Short and circumferential wall thickening
- ✓ Luminal narrowing with abrupt edges
- ✓ Non-homogenous, moderate contrast enhancement
- ✓ Prestenotic dilatation
- ✓ Adjacent fat infiltration

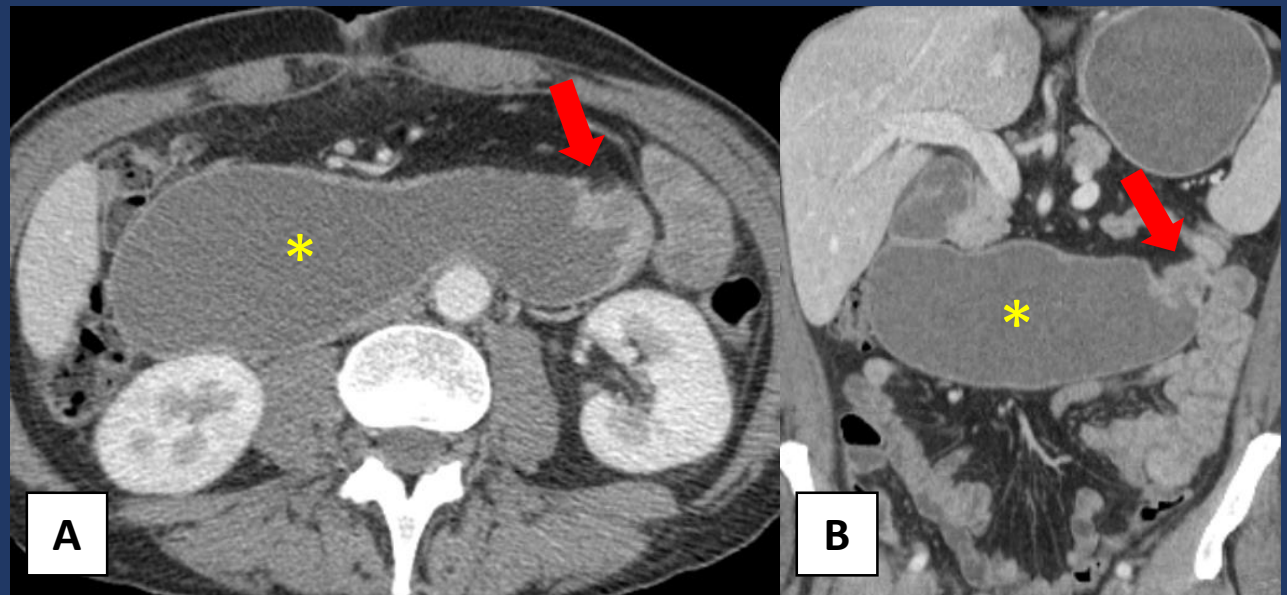


Figure 15 - Axial (A) and coronal (B) CT scans shows focal circumferential wall thickening (arrow) of the duodenum causing **stenosis with prestenotic dilatation** (asterisk), typical from adenocarcinoma.

MALIGNANT LESIONS

ADENOCARCINOMA

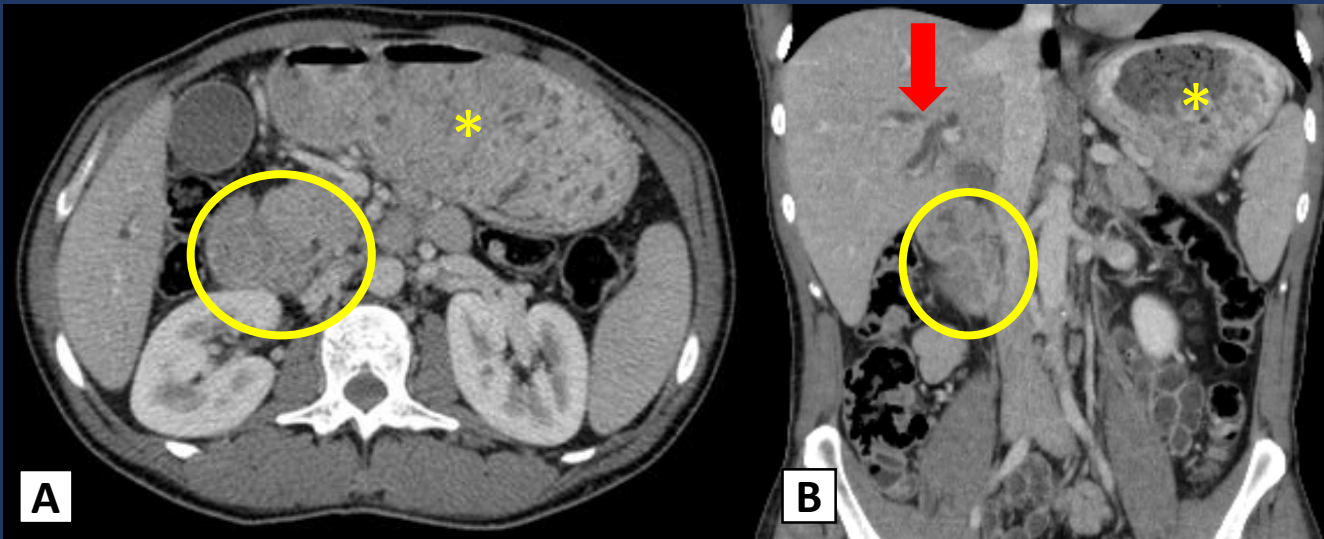
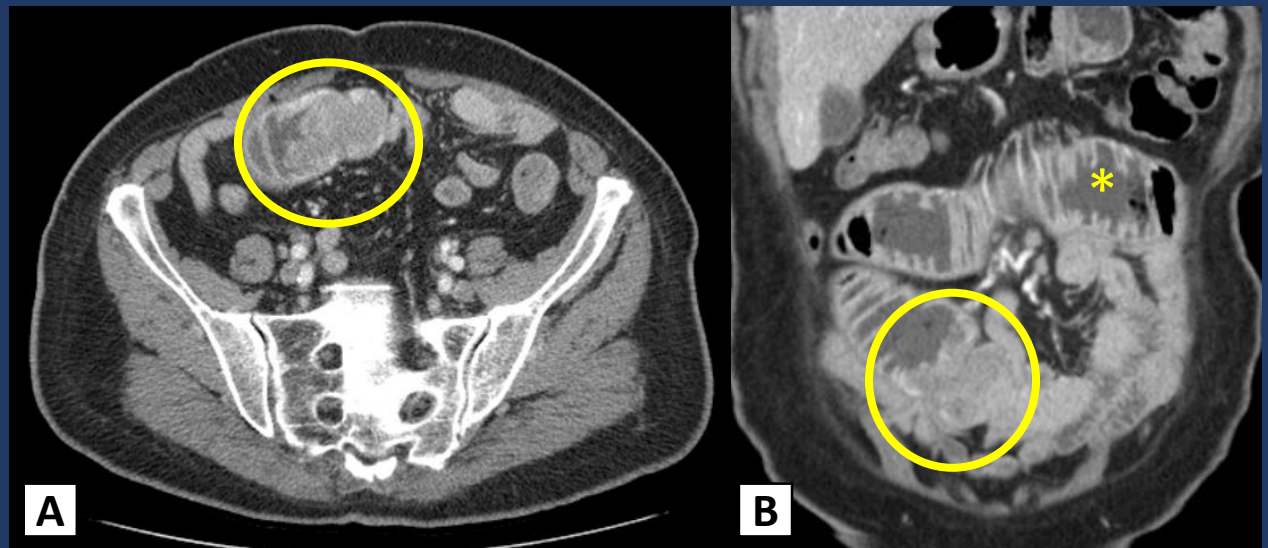


Figure 16 - Axial (A) and coronal (B) CT scans showing circumferential wall thickening of duodenum (circle), in the ampullary region, causing **intrahepatic biliary dilatation** (arrow) and **gastric stasis** (asterisk).

Figure 17 - Axial (A) and coronal (B) CT images showing bowel obstruction (asterisk) from a **solid and stenotic mass** (circle) in a jejunal loop.



ADENOCARCINOMA

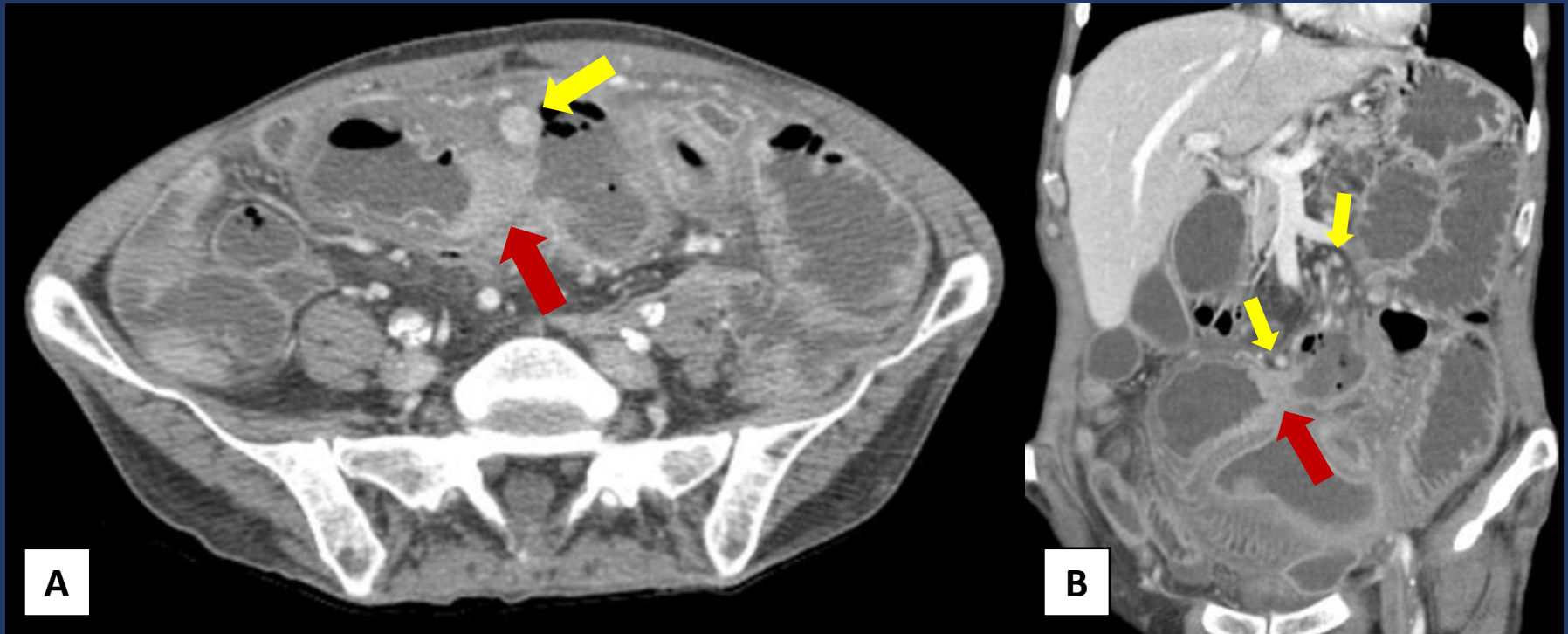


Figure 18 – Axial (A) and coronal (B) CT images showing an “apple core” adenocarcinoma (red arrow) and adjacent mesenteric adenopathies (yellow arrow) with associated small bowel obstruction, in a cachectic patient (note the absence of subcutaneous and intra-abdominal fat).

ADENOCARCINOMA

- Large adenocarcinomas may have similar characteristics to lymphoma; however, nodal metastases are less bulky in adenocarcinoma.



Figure 19 – CT image shows an **extensive wall thickening** of the proximal duodenum (circle) with luminal dilatation. The location and absence of bulky adenopathies pointed to adenocarcinoma, which was confirmed after surgical resection.

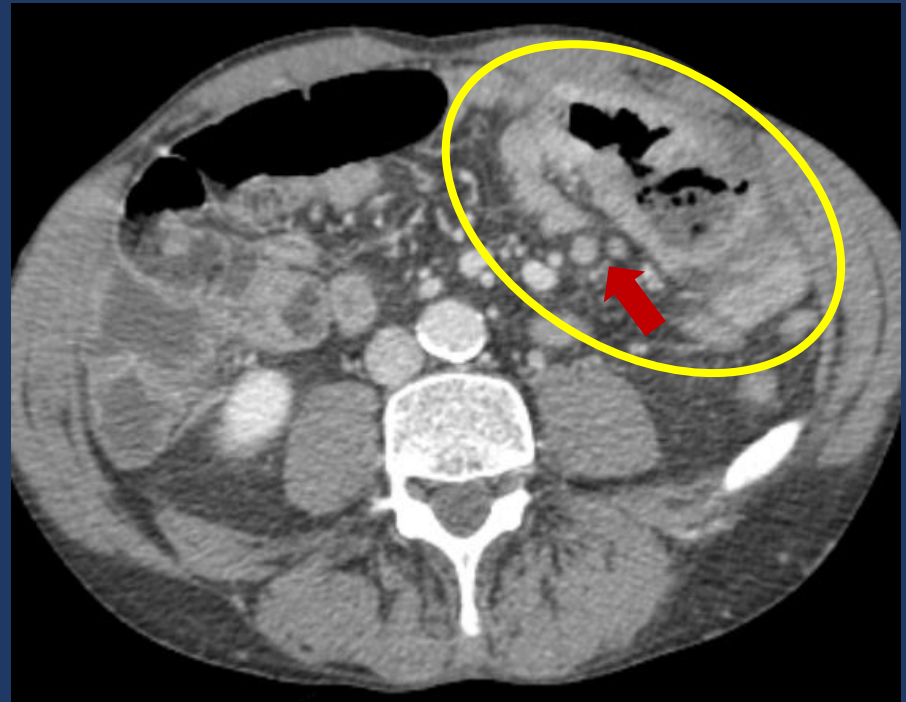


Figure 20 – CT image demonstrate a **circumferential thickening of jejunal wall** (circle) with luminal dilatation and small adjacent adenopathies (arrow). This proved to be an adenocarcinoma.

- 15-20% of malignant small bowel tumors.
- **Ileum** is the most involved segment, due to more abundant submucosal lymphoid tissue
- Rarely causes bowel obstruction.

CT IMAGING FEATURES:

- ✓ Extensive circumferential and nodular wall thickening with or without luminal dilatation - *aneurysmal dilatation*
- ✓ Large exophytic mass
- ✓ Polyp causing intussusception
- ✓ Bulky mesenteric lymph nodes

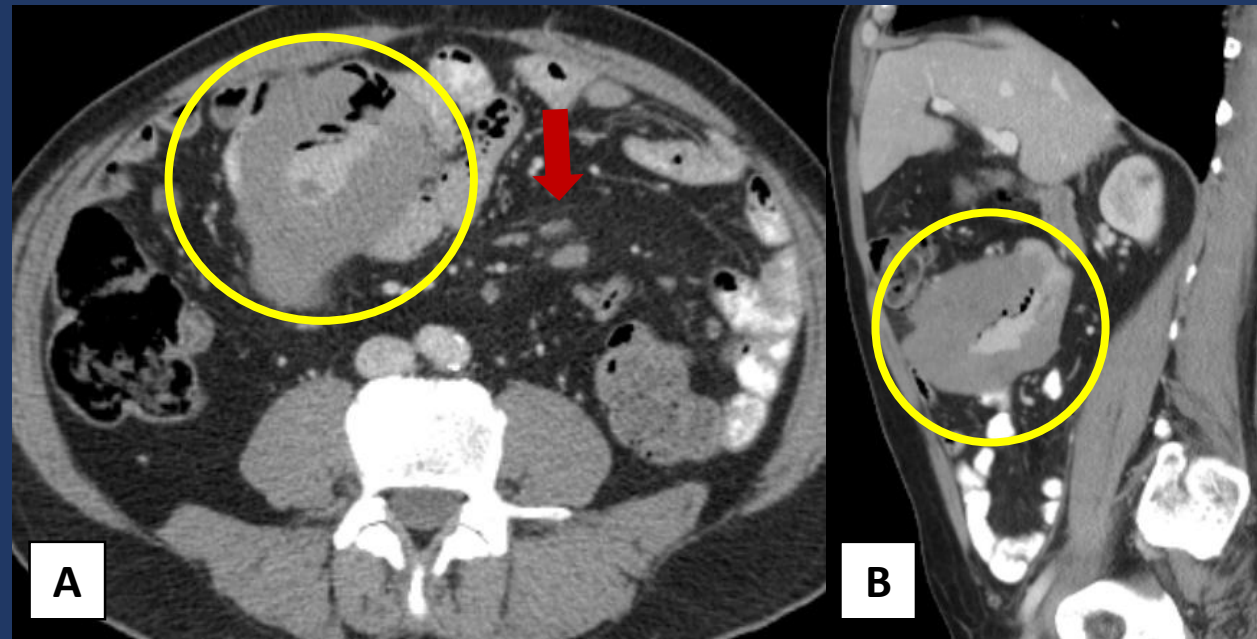


Figure 21 – Axial (A) and sagittal (B) CT scans shows **marked thickening** of the ileum (circle) and adjacent **mesenteric lymph nodes** (arrow), typical findings of lymphoma.

ULTRASOUND IMAGING FEATURES:

- ✓ Exuberant and hypoechogenic thickening of the intestinal wall
- ✓ Ulcerated masses with *ringdown* artifact
- ✓ Mesenteric adenopathies

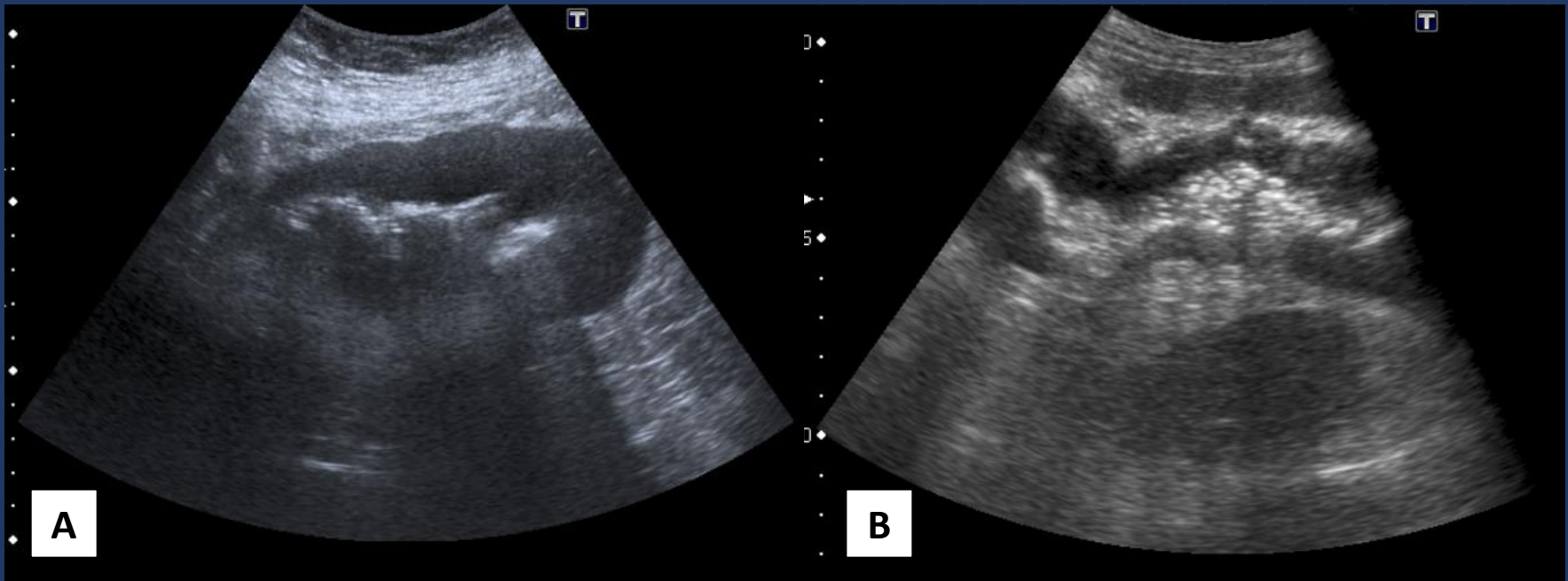


Figure 22 – **Small bowel lymphoma.** A) Marked hypoechoic round mass with central echogenicity with “ringdown” gas artifact, which corresponded to a thickened loop with luminal gas. B) Extensive segment of thick gut with total loss of normal wall layering.

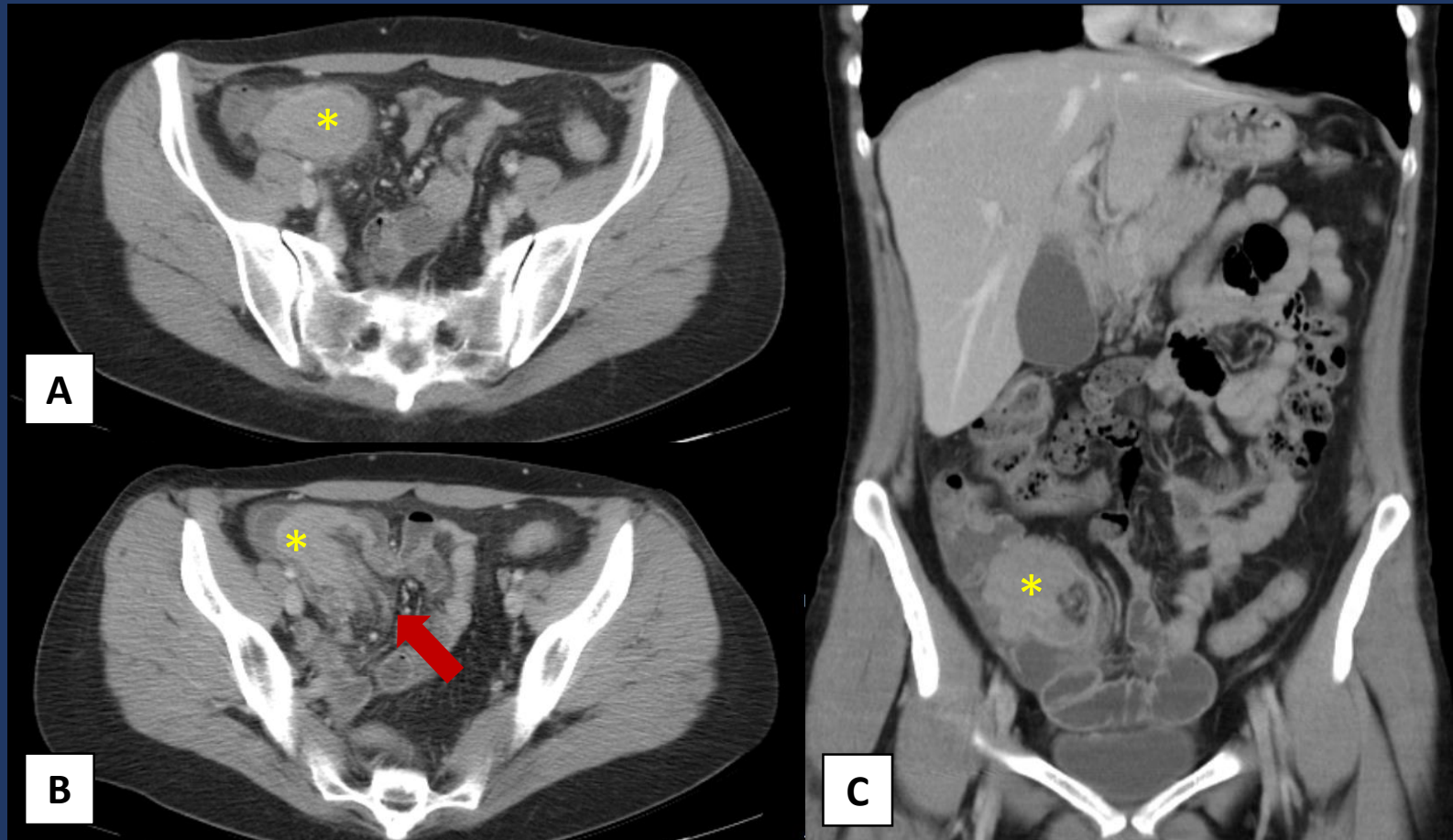


Figure 23 – Axial (A, B) and coronal (C) contrast-enhanced CT shows **ileocolic intussusception** (arrow) caused by a large **polyp** (asterisk), that was found to be a lymphoma.

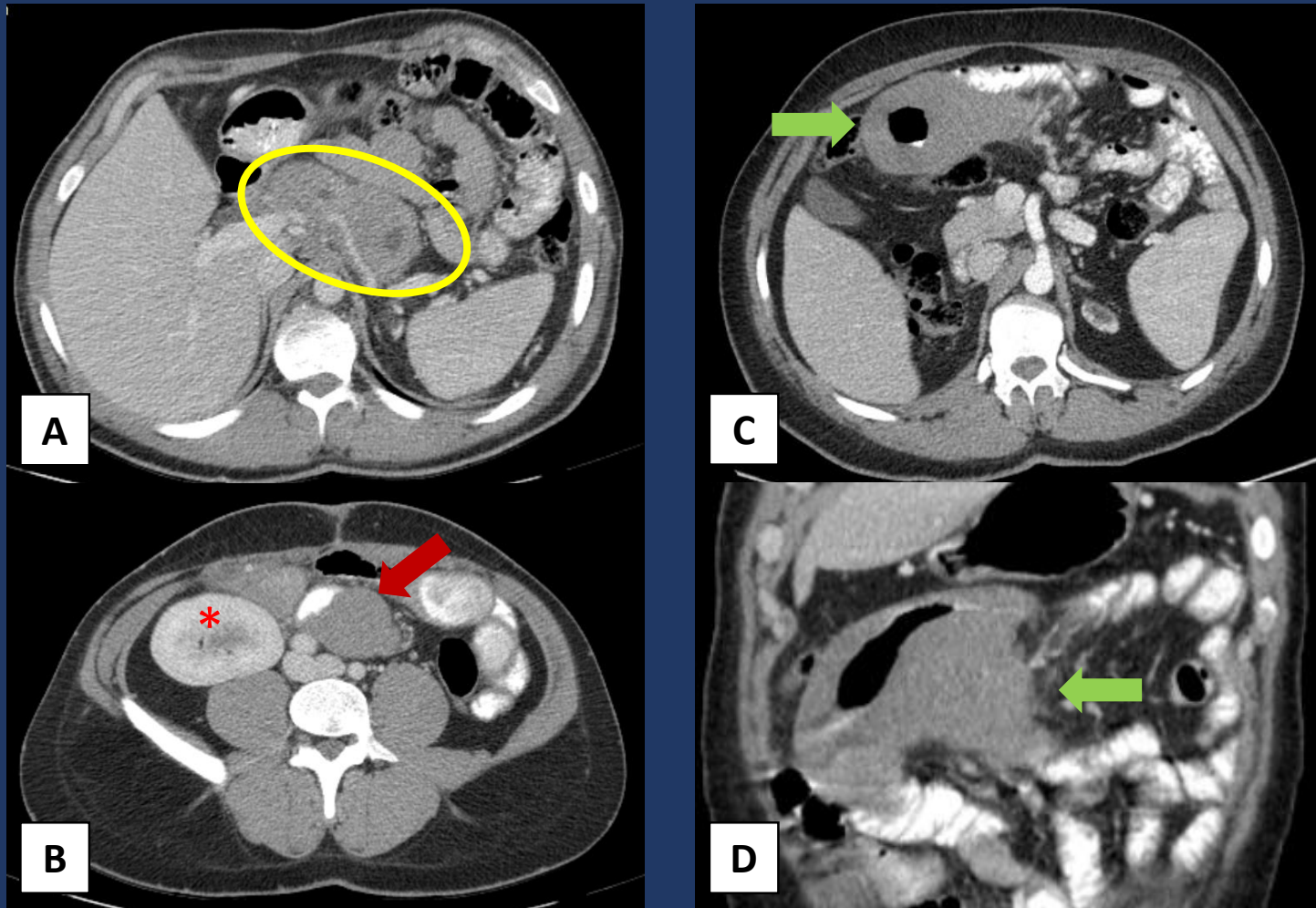


Figure 24 – Axial (A, B) CT scan of a patient with a renal transplant shows **bulky retroperitoneal adenopathies** (circle) and a **soft-tissue exophytic mass** in an ileal loop (red arrow), which after the resection revealed to be a lymphoma. Note the transplanted kidney in the right iliac fossa (asterisk). In a two-years follow-up axial (C) and coronal (D) CT scan, the patient had **recurrence of the lymphoma** (green arrow).

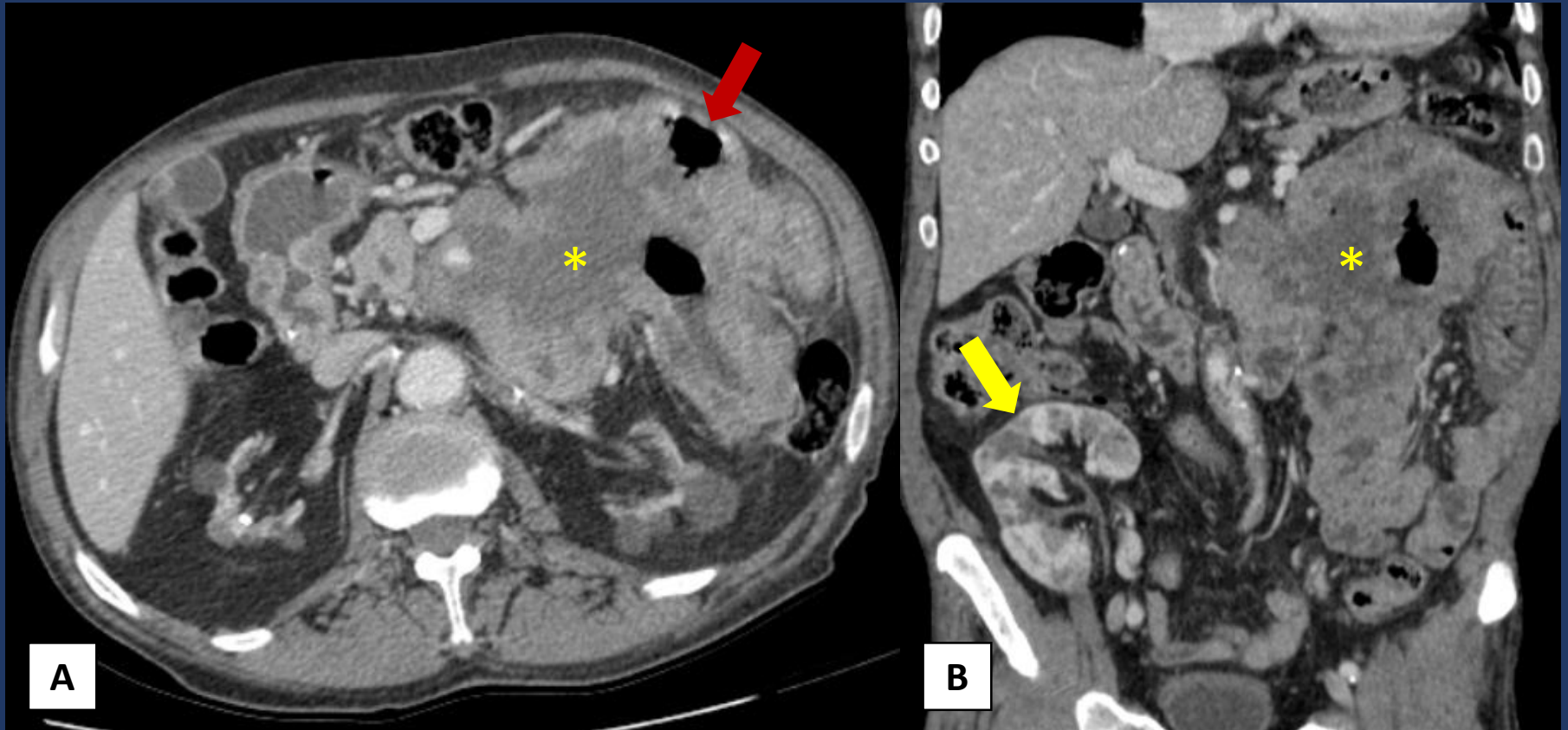


Figure 25 - Axial (A) and coronal (B) CT demonstrates a **extensive and irregular thickening** of a jejunal loop with **aneurysmal dilatation** (asterisk) and **ulceration** (red arrow), typical of a small bowel lymphoma. This represent a post-transplant lymphoproliferative disorder after a kidney transplant (yellow arrow) (note the atrophic native kidneys).

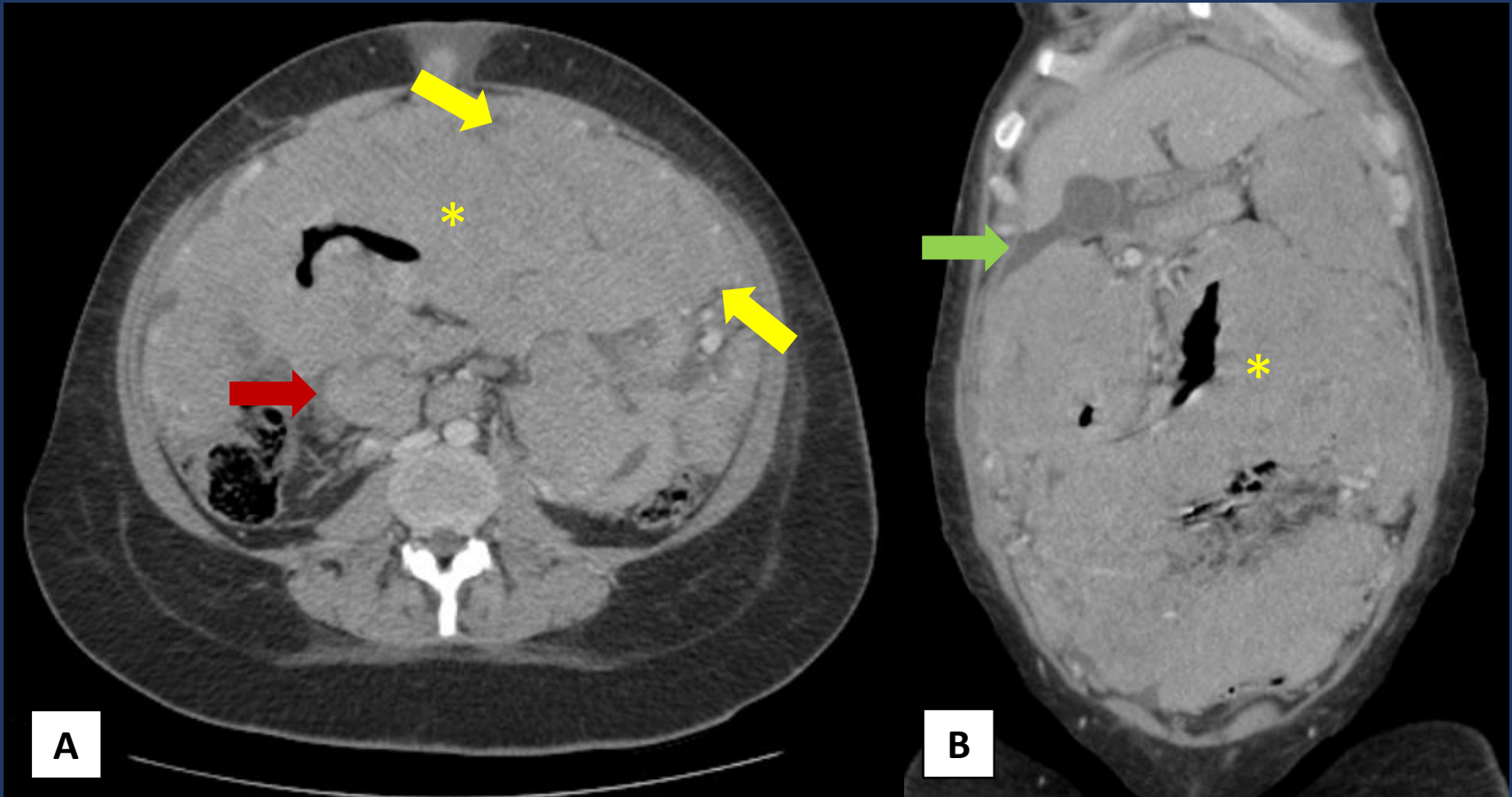


Figure 26 - Axial (A) and coronal (B) CT images shows **exuberant diffuse parietal thickening of several intestinal small loops** (asterisk), difficult to be individualized from each other, with patent lumen, proved to be lymphoma. Note the associated **multiple bulky adenopathies** (red arrow), **omental cake** (yellow arrow) and small ascites (green arrow), signs of peritoneal lymphomatosis, a rare entity.

- In a patient with a known neoplasm, a small bowel mass is most likely a metastasis.
- Metastases can occur by direct extension, peritoneal seeding and hematogenous spread.
- **Melanoma, lung, breast, kidney, colon and ovarian** are the most frequent primary sites.

CT IMAGING FEATURES:

- ✓ Segmental wall thickening or endoluminal masses, causing transient intussusception or ulceration
- ✓ Small contrast-enhancing nodules along the serosal surface

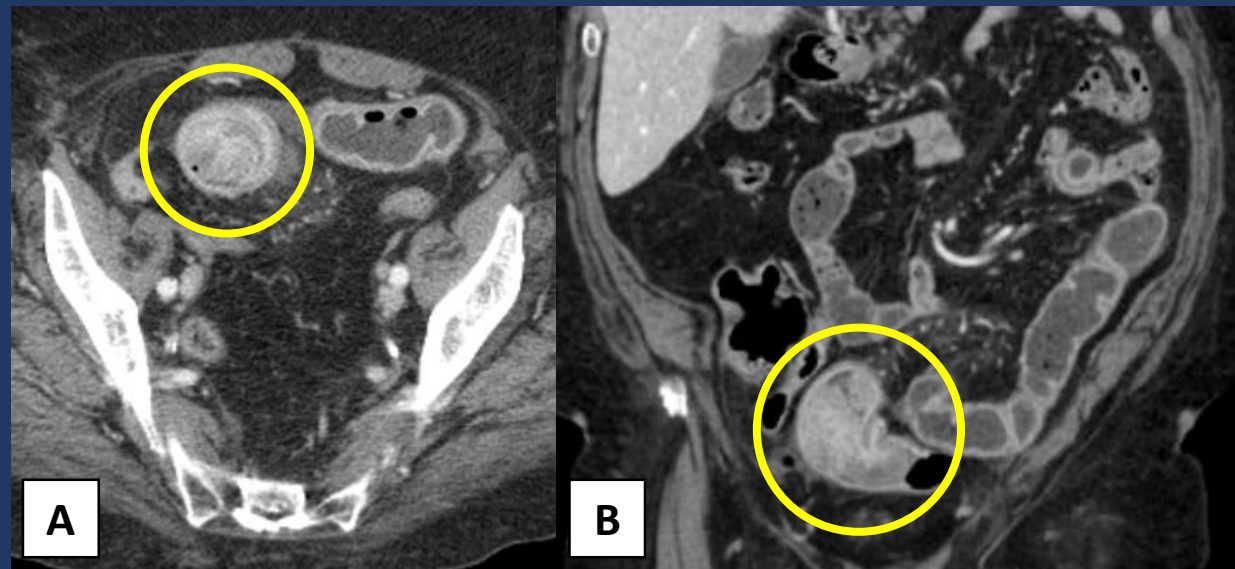


Figure 27 – Axial (A) and coronal (B) CT images of a patient with history of **melanoma**, showing an **endoluminal mass with heterogeneous enhancing** (circle), causing slight distension of the upstream loops, suspected of metastatic lesion that was confirmed after surgery.

SARCOMATOID CARCINOMA

- Extremely rare malignant neoplasm of the small bowel with a very poor prognosis.
- Only about 30 cases have been reported to date.

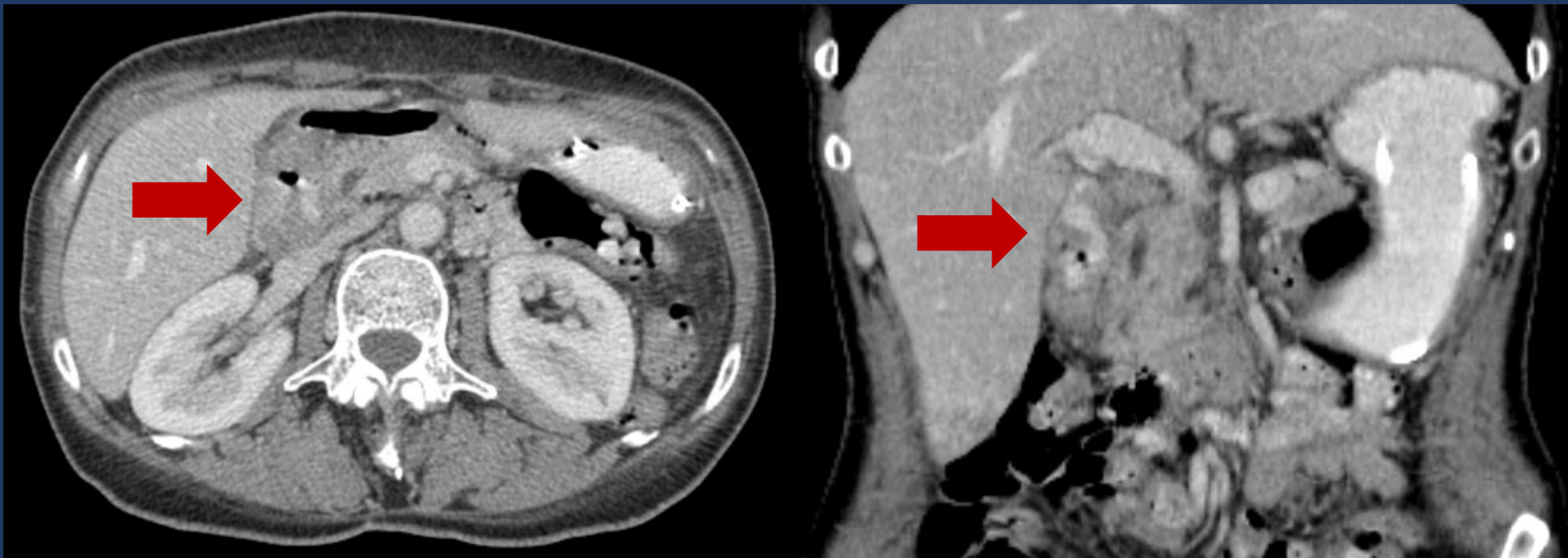
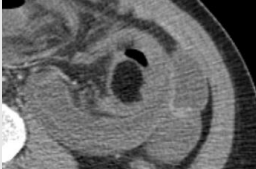
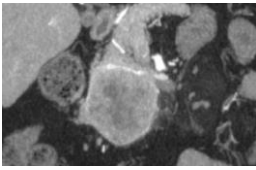
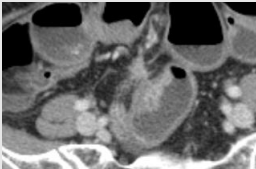
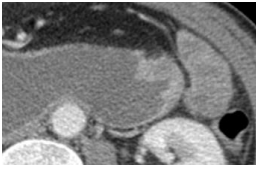
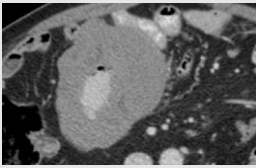


Figure 28 – Axial (A) and coronal (B) contrast-enhanced CT image show a **focal and irregular thickening** of the duodenal wall (arrow) without cleavage plane with the head of the pancreas, that resembles an adenocarcinoma. The anatomopathological result of the surgical specimen was sarcomatoid carcinoma.

SUMMARY

Small bowel tumor	Typical localization	Characteristic features on CT	Example CT image
Lipoma	ileum	ovoid mass with fat attenuation	
GIST	duodenum	exophytic rounded mass with heterogeneous enhancement	
Carcinoid	ileum	brightly enhancing polypoid lesion associated with a spiculated mesenteric mass	
Adenocarcinoma	duodenum	narrowing annular mass with abrupt irregular margins	
Lymphoma	ileum	extensive and marked wall thickening with luminal dilatation	

CONCLUSIONS

- Tumors of the small bowel are rare and are often discovered late in their clinical course.
- CT enterography is a powerful tool in the diagnosis of these lesions.
- Distinctive radiologic features are highly suggestive of a specific small bowel tumor, so the knowledge of these is essential to for the correct diagnosis.