**Pearls and pitfalls in abdominal CT**

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**Objectives**

- Review sources of error in abdominal CT
- Present updated information on common problematic CT findings ("pearls")
- Describe some common or important missed and mistaken diagnoses in abdominal CT ("pitfalls")

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**Sources of potential error**

- Perception
- Interpretation → Problems
- Communication
  - Technical artifacts
  - Benign mimics
  - Forgotten diagnoses

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**Interpretative errors in body CT**

- Study of 694 abdominal CT scans
- Evaluated by faculty consensus (n = 3-5)
- Errors detected in 56/694 (7.6%)
  - 19/56 (34%) clinically significant
  - 7/56 (12%) affected management

*JCAT 1997; 21: 681-685*

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**Superior diaphragmatic nodes**

- Drain lymph from liver & peritoneal cavity
  - Synonyms: Pericardiac, cardiophrenic, epiphrenic
- Enlarged (> 5mm) in:
  - Peritoneal malignancy (especially ovarian cancer)
  - Cirrhosis/chronic hepatitis (correlates with activity)
  - Liver metastases

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Ovarian cancer

- Confer stage IV prognosis in ovarian cancer
  
  Clinical Radiology 1997; 52: 692-697

Benign liver disease

- Reflects inflammation in chronic hepatitis
  
  AJR 2002; 179: 417-422

Liver metastases

- Do not worsen prognosis in colon cancer
  
  J Comput Assist Tomogr 2008; 32: 173-177

Pseudo-peritoneal implant

Lateral arcuate ligament

- Nodular projection into retroperitoneum
  - 5 of 100 unselected CT scans, bilateral in 3
- Clue: Bandlike continuity with the diaphragm
  
  Radiology 1992; 185: 105-108

Lateral arcuate ligament

- Superior
- Inferior
**Pseudo-retrocrural adenopathy**

- 6 HU

**Giant cisterna chyli**

- Lymph sac origin of thoracic duct
- Fluid filled retrocrural structure
- Prevertebral, usually on right

*Radiology* 1996; 199: 477-480  
*AJR* 2000; 175: 1482

**May see layering gadolinium – 10 min delay and thereafter**


*Images courtesy of Dr. Diego Ruiz*

**Incidental finding at lumbar spine MRI performed for back pain in a 57 year old woman**

**Pseudolipoma of the IVC**

- Superior to Inferior

**Pseudo-thrombosis of the IVC**

*ARTERIAL PHASE*  
*PORTAL VENOUS PHASE*
Pseudo-thrombosis of the IVC

ARTERIAL PHASE

PORTAL VENOUS PHASE

Inflow from accessory right hepatic vein

Courtesy of Dr Benjamin Yeh, UCSF

Pseudo-thrombosis of the IVC

62 year old woman

Current CT

4 months before

Pseudocirrhosis

- Stage IV breast cancer after chemotherapy
- CT findings (UCSF series of 91 patients):
  - Localized (57%) or diffuse (18%) contour irregularity
  - Diffuse or segmental volume loss (29%)
  - Caudate lobe (5%) or diffuse (1%) enlargement
  - Signs of portal hypertension (9%)
- Pathological basis:
  - Capsular retraction due to tumor fibrosis
  - Nodular regenerative hyperplasia

AJR 1994; 163: 1385-1388
Clinical Imaging 2007; 31: 6-10

Pseudocirrhosis

Baseline

9 months

18 months
Other post-chemotherapy changes

Baseline 8 months

Pseudoprogression of breast cancer

Baseline 3 months

Diffuse hepatic abnormality

24 year old - leukemia
84 year old - dyspnoea

“Nutmeg” liver

- Mosaic patchy reticular enhancement
- “Shattered glass” appearance
- Causes: Passive congestion, Budd-Chiari
- Rarely progresses to cirrhosis

Radiology 1989; 170: 795-800

Pseudo-metastases

NECT CECT

CECT T2 MRI

Second case
Biliary hamartomas: Radiology

- Synonym: Von Meyenburg complexes
  - Disordered ducts in fibrous stroma
  - Solid to cystic on pathology
  - Autopsy incidence of 0.7-2.8%
- Multiple small lesions:
  - US: Hypoechoic, +/- "ring-down"
  - CT: Non-enhancing hypodense
  - MRI: Hyperintense on T2

Do biliary hamartomas matter?

- 8 reported cases of biliary hamartomas associated with cholangiocarcinoma….

Arch Pathol Lab Med. 2000; 124: 1704-1706

Pseudo-biliary dilatation

CECT  T2 axial

Pseudo-biliary dilatation

ERCP

Peribiliary cysts

- Retention cysts of peribiliary glands
- Usually incidental; but can cause jaundice
- Mimics biliary dilatation
- May be idiopathic or secondary to:
  - Cirrhosis/liver disease, ADPKD

Peribiliary cysts

Peribiliary cysts - ADPKD

Spiral CT: Splenic artifact

Pseudo-colon

Second case of splenic infarction
Adenomyomatosis

- Wall thickening due to mucosal herniations
- Etiology unknown
- 7% autopsy incidence
- Usually associated with gallstones
- Significance of acalculous form is unknown

Patterns of adenomyomatosis

Br J Radiol 1986; 59: 29-34

Accuracy of CT

- Distinction from gallbladder cancer:
  - CT study of proven adenomyomatosis (n = 22) and gallbladder cancer (n = 14)
- Detection of intramural diverticula:
  - N = 8 for R1, all adenomyomatosis
  - N = 11 for R2, 8 adenomyomatosis, 3 cancer

AJR 2007; 189:62-66

Pseudo-perinephric fluid
Study of minor abnormalities

- Lung cancer and serial CT (n = 197)
  - Mean follow-up of 481 days (2-1801)
  - Baseline: Normal or minor abnormality
  - Endpoint: New mass (=metastasis)
- Minor abnormalities and subsequent metastases are NOT associated

<table>
<thead>
<tr>
<th>Baseline morphology</th>
<th>Number of adrenal glands</th>
<th>Metastases on follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>253 (258)</td>
<td>3.6% (3.1%)</td>
</tr>
<tr>
<td>Smooth enlargement</td>
<td>70 (45)</td>
<td>1.4% (0%)</td>
</tr>
<tr>
<td>Nodular</td>
<td>71 (91)</td>
<td>4.2% (5.5%)</td>
</tr>
</tbody>
</table>

Example

**Baseline CT**

**Outcome CT**
**Gastric fundal diverticulum**

**Pancreatic pseudolesion**

**Pancreatic pseudolesion**

**Anterior abdominal wall**

**Pseudo-abscess after gastric bypass**

**Antral gastritis?**

- MDCT of 153 patients without gastric disease:
  - Wall > 5 mm in 56%
  - Wall > 10 mm in 5%

- Do not overcall!

Pickhardt et al, AJR 2003; 181:973-979


**45 year old man with pancreatitis**

*Reported as “pneumatosis”*

*CT one day later*

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**True pneumatosis**

*Signs of true pneumatosis:*
- Circumferential
- Dissected mucosa visible

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**55 year old man: Follow-up CT**

*COLITIS?*

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**Colonic wall thickening in cirrhosis**

- Wall > 6 mm in 21 of 57 (37%) cirrhotics:
  - *Non-inflammatory in 18*
  - Infectious colitis in 2
  - Ischemic colitis in 1
- Isolated/predominantly right colon: 14 of 21

*AJR 1999; 172: 919-924*

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**Pseudo-cecal cancer**

*Follow-up CT*

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**Pseudo-cecal cancer**

*Pseudo-wall thickening*

*Real wall thickening*
**Pseudo-cecal cancer**

*Apparent cecal mass seen at staging CT in 79 year old woman with newly diagnosed NSCLC*

**Delayed CT one day later***

**Pseudo-sigmoid stricture**

After rectal contrast

**Pseudo-perforation**

*75 year old woman with acute severe abdominal pain – on peritoneal dialysis for end-stage renal disease*

**Baseline CT**

**8 hours later – “R/O perf”***

**Enhancing ascites**

- Georgetown study (n = 50):
  - All with ascites and CECT and DECT
  - No clinical signs of bleeding or perforation
- Delayed enhancement of ascites in 54%:
  - Mean increase of 25 HU (range, 7-54)
- No relationship with:
  - Ionic versus nonionic contrast
  - Time delay (range, 10-104 min)
  - Benign versus malignant history
  - Serum creatinine or albumin

*AJR 1993; 161: 787-790*

**Renal excretion after aborted G-tube insertion***

**Corpus luteum cyst**

- Post-ovulation follicle
- Vascular crenelated wall
- May appear suspicious – but resolves

**Corpus luteum cyst**

Case 1

Case 2
Imaging of corpus luteum cysts

- US: Irregular cyst, echogenic crenulated wall, internal low level echoes +/- dependent layering, and "ring of fire" on Doppler
- CT: Under 3 cm with a thick, crenulated, or hyperdense wall

Corpus luteum cyst – PET findings

Pseudo-ovarian lesion

ECT

Delayed CECT

Lower quadrant pseudotumors

OVARIAN TRANSPOSITION

35 year-old post-hysterectomy for cervical cancer

Pseudo-cervical cancer

Early post-contrast

Late post-contrast

Sagittal reformats

Explanation

Due to normal differential and delayed enhancement of cervix versus myometrium of uterine body
**Explanations**

**Normal uterus - MRI**

- T2 sagittal
- T1 sagittal post-gad

**Another case...**

- **Reported as “right adnexal mass”**

**Vaginal pessary**

- Usually elderly women
- Provides support for pelvic floor

**29 year old with UPJ obstruction**

**NuvaRing®**

- Novel vaginal contraceptive device:
  - Inserted day 1 to 5 of cycle
  - Removed after 3 weeks
  - New ring inserted in next cycle

- Releases low doses of sex hormones:
  - Etonogestrel and ethinyl estradiol
  - Systemic absorption; inhibit ovulation

- Characteristic CT appearance

  *AJR 2003; 180: 1659-1660*

**Pseudo-abscess**

- **NOT BOWEL**

  Patient 1  Patient 2
**Gelfoam/Surgicel**
- Absorbable cellulose sponge
- Used for hemostasis
- May mimics abscess

**“Pseudo-abscess”**

**CT**

**Groin pseudotumor**

**Sartorial muscle flap**
- Protects femoral vessels after radical inguinal lymphadenectomy
- Results in mass anterolateral or anterior to the femoral vessels on CT
- Potential for confusion with postoperative collection or recurrent tumor

**More groin pseudotumors...**

*AJR 1996; 166: 109-112*
Bone pseudo-metastasis

Case 1

Bone pseudo-metastasis

Case 2

Progression of metastasis?

Febrary 06

April 06

Conclusion

- Many sources of error in abdominal CT
- Awareness is central to correct interpretation
- Always consider mimics and "fake-outs" first