When Good Things (or at least not-so-bad things) Look Bad...

An Overview of Selected Mimics of Metastatic Disease in Abdominal Imaging

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Objectives

- Review intra-abdominal masses which mimic metastatic disease
- Review other intra-abdominal lesions which mimic metastatic disease
- Discuss imaging features which allow correct diagnosis
- Review current diagnosis and treatment for selected lesions

Leiomyomas

- Leiomyomas of the uterus are exceedingly common (40% of women > 35 yrs)
- Uterine leiomyomas may be symptomatic - pelvic pain, menorrhagia, urinary frequency/ urgency
- Current research suggests that leiomyomas do not undergo malignant degeneration; leiomyosarcomas arise independently

Leiomyomas

- Leiomyomas may be found outside the uterus
  - Typically post-myomectomy or hysterectomy for leiomyomas
- Extrauterine leiomyomas are rare but increasingly reported – related to gynecologic surgical technique?

Leiomyomas

- Imaging of extra-uterine leiomyomas:
  - All modalities – same appearance as intra-uterine leiomyoma but extra-uterine (and very importantly, extra-ovarian) location
  - US = typically hypoechoic mass, often heterogeneous
  - MR = T1 iso-hypo-, T2 hypointense mass
- Treatment:
  - Masses generally enlarge with estrogen (ie OCP) but may regress with progesterone
  - Or just wait for post-menopausal regression
  - Spontaneous regression has been reported

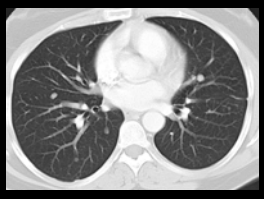
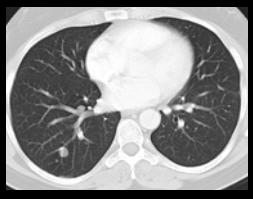
Parasitic Leiomyoma

- Exophytic leiomyomas may eventually adhere to other structures and develop an alternate blood supply, later detaching from the uterus

Benign Metastasizing Leiomyoma

- Multiple leiomyomas outside the uterus
  - 120 cases reported (2006)
  - Usual site = lung
  - Also reported = heart, brain, nodes, bone, skin
- Often indolent, rarely respiratory symptoms
- Variable imaging manifestations
  - Common = enhancing pulmonary nodules
  - Less common = small nodules, miliary nodules
  - Adenopathy is rare

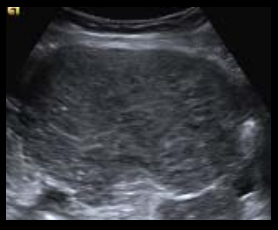
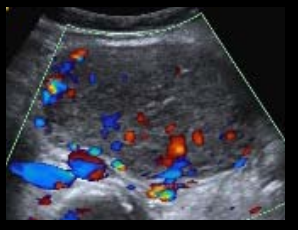
Benign Metastasizing Leiomyoma

Disseminated Peritoneal Leiomyomatosis

- Intra-peritoneal extra-uterine leiomyomas
- DDx:
  - #1 to exclude = peritoneal carcinomatosis
  - Others to consider – desmoids, lymphoma, peritoneal TB, peritoneal mesothelioma

Disseminated Peritoneal Leiomyomatosis

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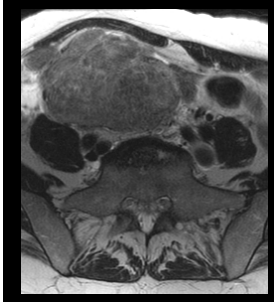
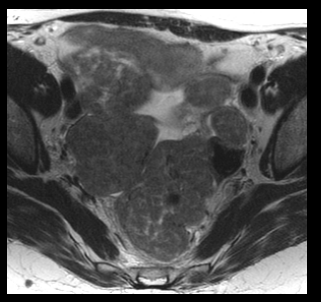

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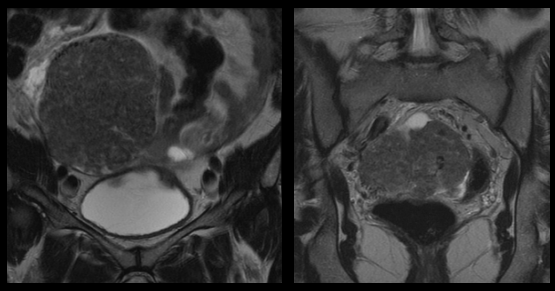

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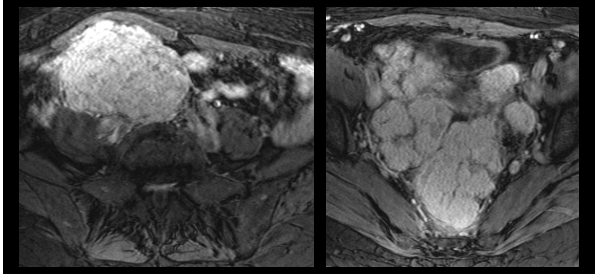

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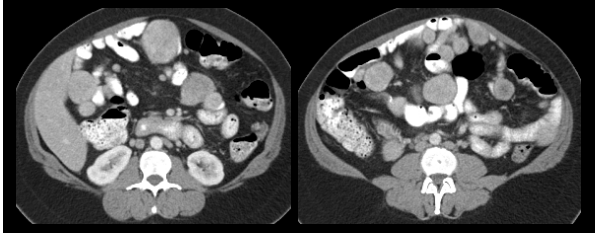

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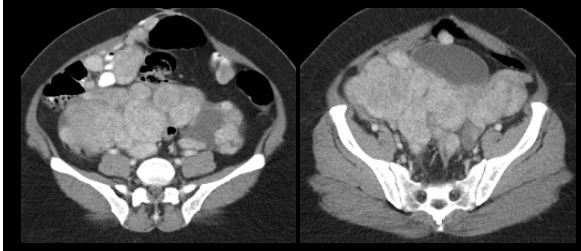

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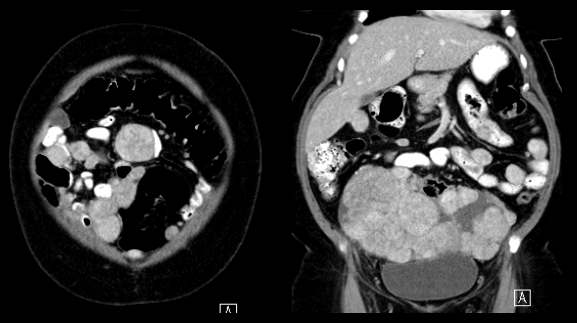


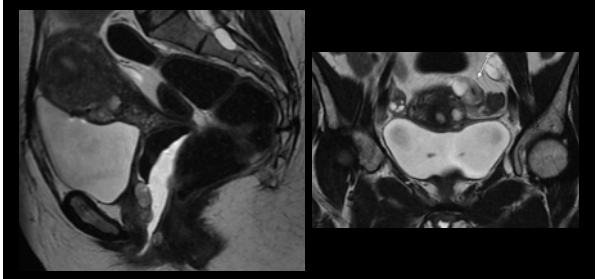
Intravenous Leiomyomatosis

- Leiomyomas in uterine and systemic veins
  - 80% have myometrial/parametrial venous involvement, ~20% extend up to the right atrium
- Rare (150 reported cases)
- Variable clinical course depending on pelvic vs IVC vs intracardiac involvement

Intravenous Leiomyomatosis

- Imaging:
  - US = venous filling defect with flow on Doppler
  - CT = enhancing intravenous filling defect
  - MR = T1 iso-hypo-, T2 hypointense enhancing intravenous mass
- DDx:
  - Intravenous leiomyosarcoma
  - Bland vs malignant thrombus
- Treatment = surgical resection +/- anti-estrogen

Intravenous Leiomyomatosis



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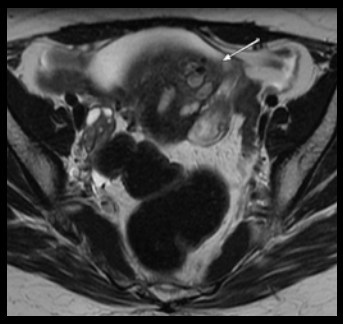

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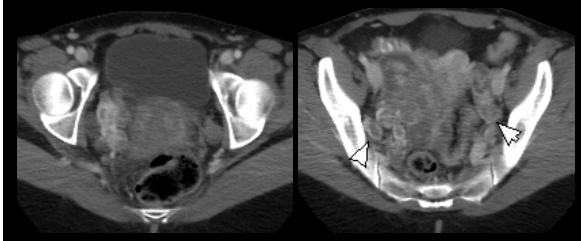

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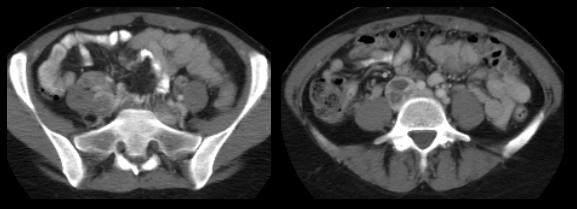

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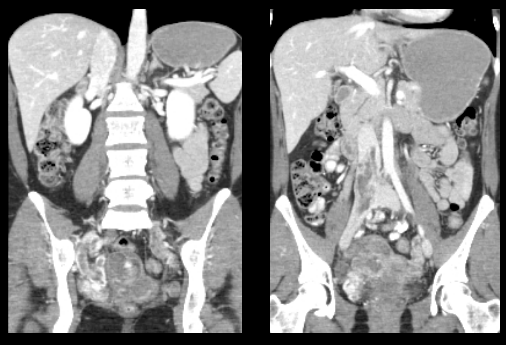
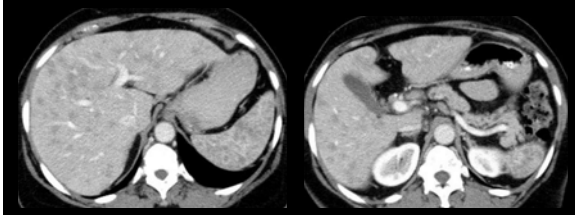


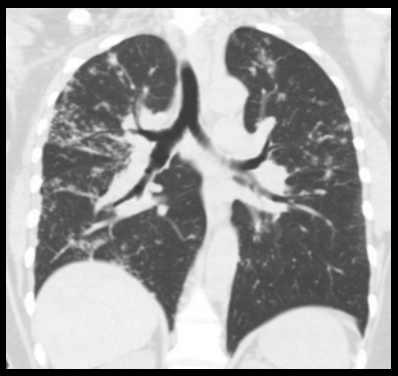
Granulomatous Disease

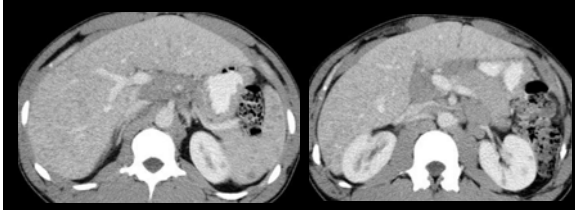
- Granulomata may present as small solid nodules
  - May have regions of central necrosis (necrotizing granuloma)
  - May seed solid organs or serosal surfaces
  - Often associated with adenopathy

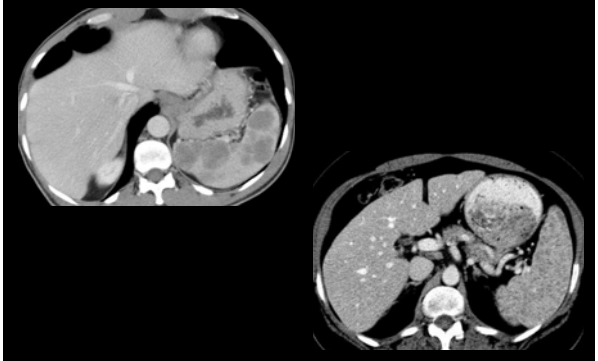
Sarcoidosis

- 90% of patients have thoracic involvement (lymphadenopathy > pulmonary parenchymal)
- Approximately 30% of patients have abdominal involvement
  - Mesenteric and retroperitoneal adenopathy is most common
  - Hepatosplenomegaly in 60%
  - Liver/spleen granulomas









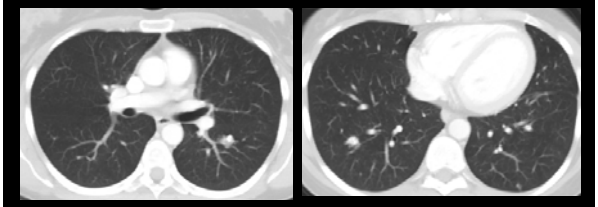
Epithelioid Haemangioendothelioma

- "Low-intermediate grade vascular neoplasms"
- But in practice, appear malignant
  - Multiple pulmonary nodules
  - Often additional hepatic (15-20%) or osseous lesions
  - Frequently with pleural masses

Epithelioid Haemangioendothelioma

- Imaging:
  - Hepatic – peripheral-enhancing hypodense round nodules which coalesce over time
- DDx = metastases (but show minimal growth)

Epithelioid Haemangioendothelioma



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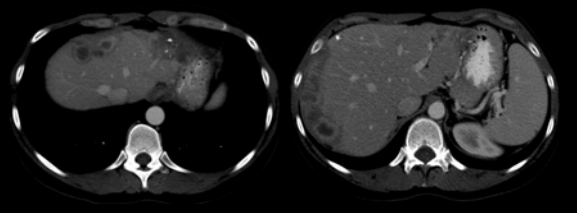

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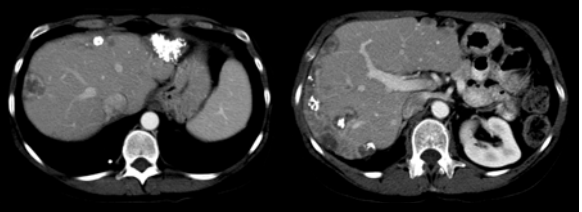
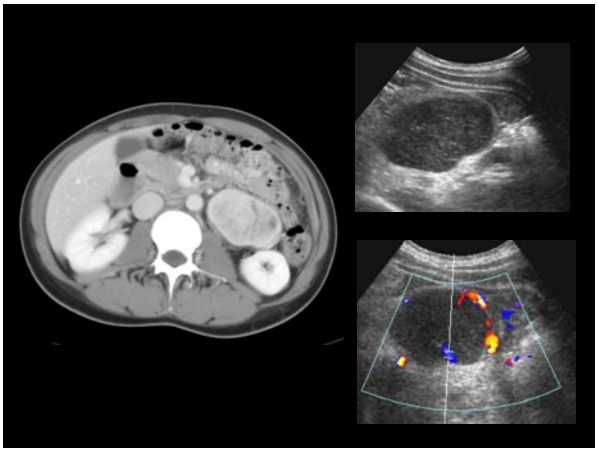


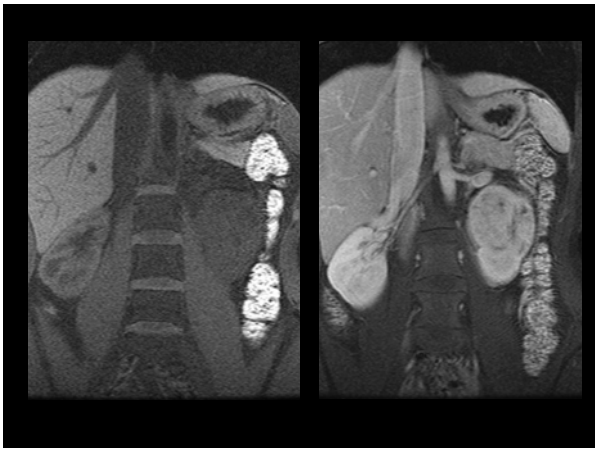
Castleman Disease

- Castleman disease = angiofollicular lymph node hyperplasia
- Subdivided into 2 histologic types and 2 clinical presentations
  - Hyaline vascular vs plasma cell type
  - Localized vs disseminated presentation
  - Localized form usually with hyaline vascular type, more common and with better prognosis

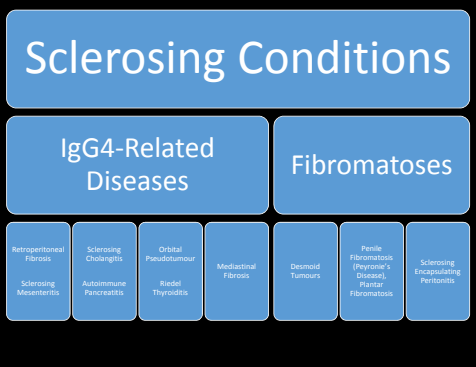
Castleman Disease

- Presentation is variable
  - Single hyperenhancing nodal mass
  - Infiltrative solitary mass
  - Extensive adenopathy but no discrete mass
- Imaging features:
  - Smaller lesions are usually hyperenhancing
  - Larger lesions are more heterogeneous
  - Calcifications in 10-15%





Infiltrative Masses Mimicking Metastases



Sclerosing Conditions

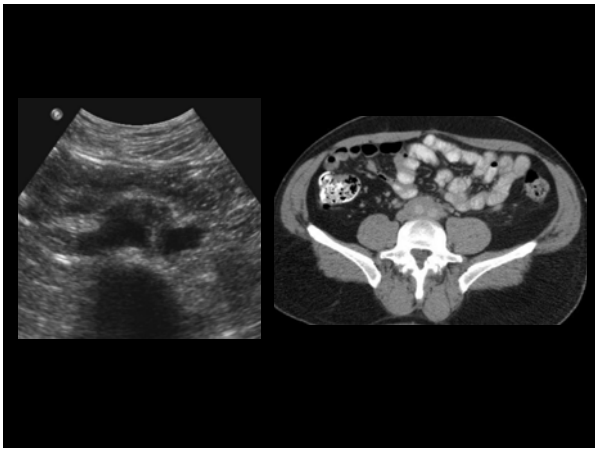
- IgG4-related disorders have 3 key pathologic features:
  - Lymphoplasmocyte infiltrate of IgG4-positive cells
  - Storiform fibrosis
  - Obliterative phlebitis
- Fibromatoses of the aggressive type are infiltrative collagenous tumours
  - Associated with mutations of the β-catenin gene

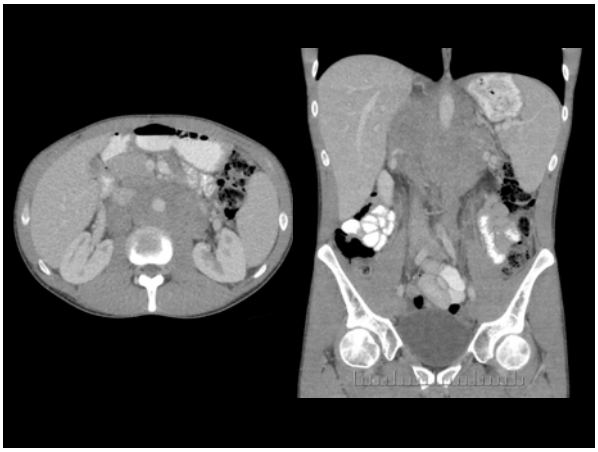
Retroperitoneal Fibrosis

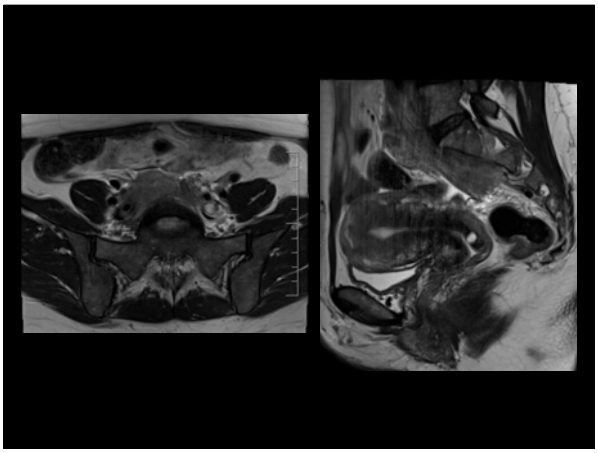
- Progressive infiltration of the retroperitoneum by fibrotic tissue
- Most "idiopathic" cases of retroperitoneal fibrosis are actually associated with IgG4 related disease
  - A small percentage of patients have true idiopathic RPF
  - RPF may also rarely be secondary to malignancy or medications

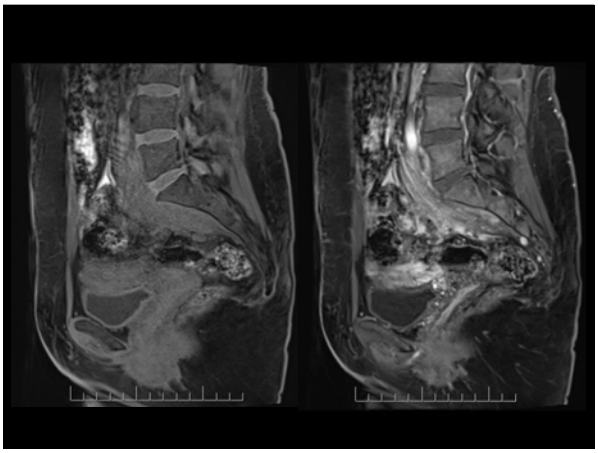
Retroperitoneal Fibrosis

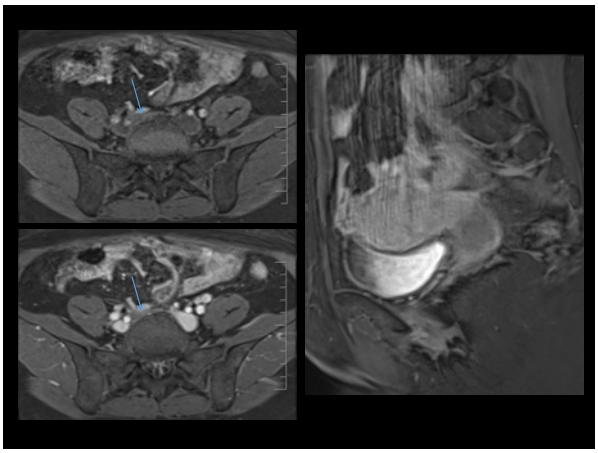
- On CT/MRI:
  - Initially, small fibrotic (CT hypodense, T2 hypointense) plaque near the aortic bifurcation
  - Progressive enlargement
    - Usually centred along the midline
    - Rarely extends lateral to psoas muscles
    - Does not displace aorta/IVC from the anterior spine









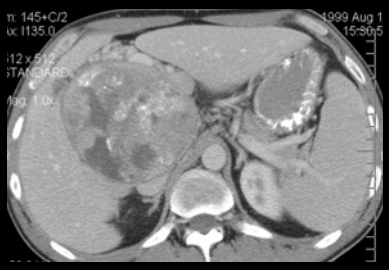


Inflammatory Pseudotumour

- Many alternate names have been proposed!
  - Inflammatory myofibroblastic tumour
  - Plasma cell granuloma
  - Fibrous xanthoma, Pseudolymphoma, Inflammatory fibrosarcoma…and others...
- Terminology is confusing
  - Inflammatory pseudotumour = fibrous process, no metastatic potential
  - Inflammatory myofibroblastic tumour = low-grade malignancy with rare (~5%) metastases

Inflammatory Pseudotumour

- On CT/MRI:
  - Variable appearance – ill-defined and infiltrative or more mass-like
  - Classically, hypodense on CT and T2 hypointense on MRI but attenuation/intensity may vary also
  - May demonstrate enhancement



Autoimmune Pancreatitis

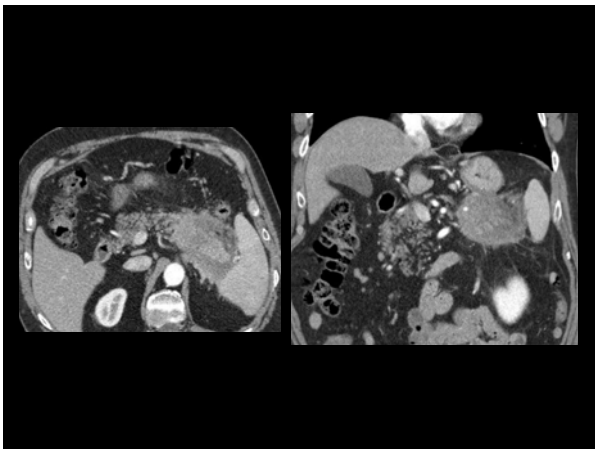
- One of the IgG4-related sclerosing conditions
  - Parenchymal infiltration by IgG-4 positive plasma cells with additional fibrosis
- Clinical features:
  - More common in males
  - Average age 60-65 years old
  - Presentation with abdominal pain and jaundice
  - 1/3 reported to present with acute pancreatitis

Autoimmune Pancreatitis

- On CT/MRI,
  - Most common = diffuse pancreatic involvement
    - "sausage-shaped" pancreas (enlarged with loss of normal lobulations)
    - +/- surrounding thin capsule, hypodense on CT or T2 hypointense on MRI
  - May also have focal involvement
    - Usually at the pancreatic head, often with upstream duct dilatation
    - Also hypodense on CT, T2 hypointense on MRI

Autoimmune Pancreatitis

- Differential diagnosis for the diffuse form = acute pancreatitis
  - Clinical correlation required
- Differential diagnosis for the focal form = pancreatic adenocarcinoma
  - Autoimmune pancreatitis may resolve on imaging after corticosteroid therapy
  - Both may be FDG-avid on FDG-PET
  - May require biopsy for definitive diagnosis



Desmoid Tumours

- A classic fibromatosis
- Benign (won't metastasize) but locally aggressive and often recurs
- Solitary or multiple, children or adults, may arise at any site
  - Most common age = 10-40 yr
  - Characterized as abdominal wall, intra-abdominal, or extra-abdominal (then most common in the shoulder/upper extremity)
  - Increased incidence at surgical or previous trauma sites

Desmoid Tumours

- Associated with mutations of beta-catenin (sporadic types) and adenomatosis polyposis coli (APC) gene (FAP, Gardner syndrome)
  - Current belief is that beta-catenin mutation and the sporadic type are mutually exclusive from APC mutation and FAP
  - Multifocal tumours → consider diagnosis of FAP and recommend colonoscopy for polyp screen

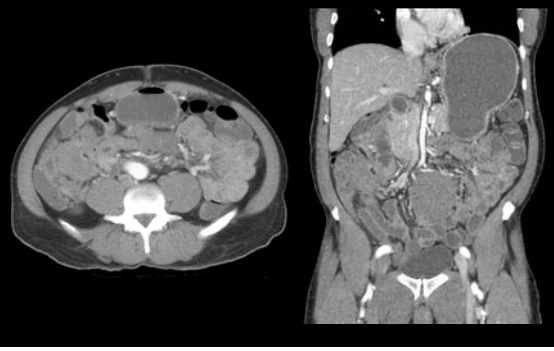
Desmoid Tumours

- Imaging Findings:
  - Infiltrative mass / masses
    - Non-specific soft tissue masses on CT; MRI suggested for work-up
  - "Classic" = T2 hypointense, no enhancement
  - BUT morphology is variable, with varying degrees of T2 hyperintense signal and enhancement
  - When multiple, internal attenuation/signal and enhancement may vary between lesions

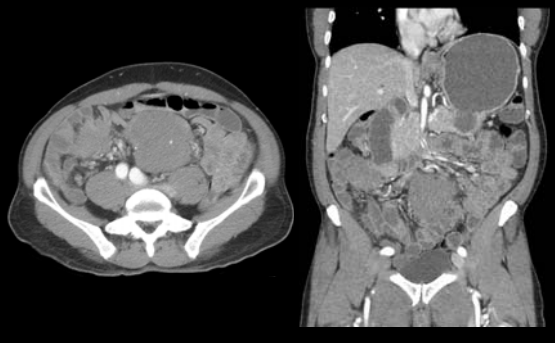
Desmoid Tumours

- Biopsy is required to confirm diagnosis
  - Main DDx = scar tissue, nodular fasciitis, fibrosarcoma
- Treatment depends on location and aggression
  - Prior standard of care = surgical resection
  - Now, first line = "Watchful waiting" ; 5-10% will at least partially spontaneously regress
  - Symptomatic → surgery, radiation or chemotherapy
  - Chemotherapy - anthracyclines, imatinib, tamoxifen

Desmoid Tumours



Desmoid Tumours



Metastatic Mimics with Malignant Association

Hepatic Adenomatosis

- Classically, a condition of multiple hepatic adenomas
  - Idiopathic; no glycogen storage disease or steroids
  - Over 10 lesions required
- Adenomatosis is a historical diagnosis; histologically, lesions are identical to solitary hepatic adenomas
  - Current thought is to diagnose multiple hepatic adenomas rather than a separate entity of adenomatosis

Hepatic Adenomatosis

- Risk factors for hepatic adenomas:
  - Female
  - Oral contraceptive use
  - Hepatic steatosis
  - Obesity/metabolic syndrome
  - Anabolic steroids
  - Glycogen storage diseases

Hepatic Adenomatosis

- Subtypes have recently been defined based on molecular characteristics; clinical correlations have also been outlined
  - HNF1A mutation (with contraceptive use)
  - β-catenin activated mutation (with obesity)
  - Inflammatory (with androgen use)
  - Undetermined
- β-catenin activated type are at higher risk of malignant transformation to HCC

Hepatic Adenomatosis

- Variable imaging appearance on MRI
  - Often T1 hyperintense or with signal loss on T1 out-of-phase series (fat content)
  - Variable enhancement
  - No hepatobiliary phase uptake on Primovist MR

Hepatic Adenomatosis

- Treatment:
  - If on oral contraceptives, stop
  - If mass > 5 cm, resect
    - Other indications for resection = symptomatic, enlarging, β-catenin activated subtype, indeterminate
  - Other treatment options = trans-arterial embolization, radiofrequency ablation
  - If mass < 5 cm and of low-risk HNF1A-mutation subtype, consider conservative management with serial imaging follow-up

Oncocytosis

- "Bilateral, multifocal, and synchronous renal oncocytomas"
- MSKCC 2011 review (Journal of Urology):
  - 85% are asymptomatic (incidental imaging diagnosis)
  - 50% have chronic renal disease at diagnosis
  - 100% undergo nephrectomy (partial or total);
    - >1/2 of resected tumours = oncocytoma/ chromophobe RCC hybrids
    - ¼ = chromophobe RCC

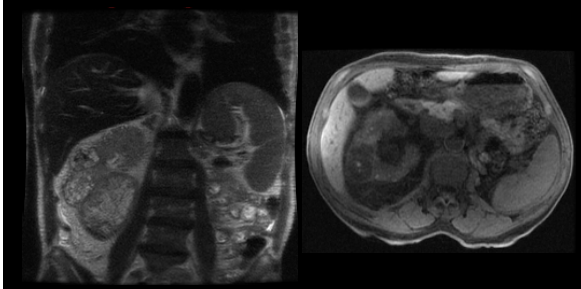
Oncocytosis

- Oncocytomas are benign without malignant potential
- But in patients with oncocytosis, hybrid (oncocytoma and chromophobe RCC) tumours and chromophobe RCC comprise ~85% of the dominant masses
- In the largest series, 70% of patients had chromophobe RCC among their renal masses
- Pathologically, oncocytomas resemble chromophobe RCC, so biopsy is considered unreliable and complete lesion resection is recommended
  - However, new genetic markers (ie microRNA 15a) may help to differentiate oncocytoma from RCC

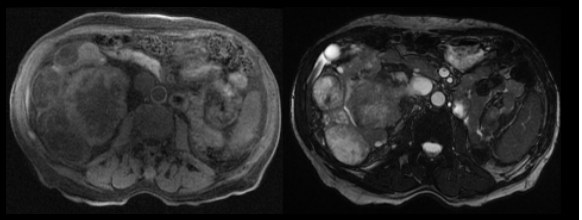
Oncocytosis

- Imaging features:
  - All modalities – solid renal vascular/enhancing mass lesion
  - May have a stellate central scar on CT/MRI; this is not a distinguishing feature, as RCC may also demonstrate a central scar

Oncocytosis



Oncocytosis



Mimics of Paediatric Metastatic Disease

Nephroblastomatosis

- Paediatric condition – persistence of multiple nephrogenic rests
  - Kidneys develop from the ureteric bud and metanephric blastema
  - Immature metanephric blastema will persist as nephrogenic rests
  - Genetic associations – often abnormal Wilms' tumour suppressor genes

Nephroblastomatosis

- Intralobar (within parenchyma) vs perilobar (diffuse perinephric)
- Very rare, only reported in infants < 4mo = panlobar nephroblastomatosis

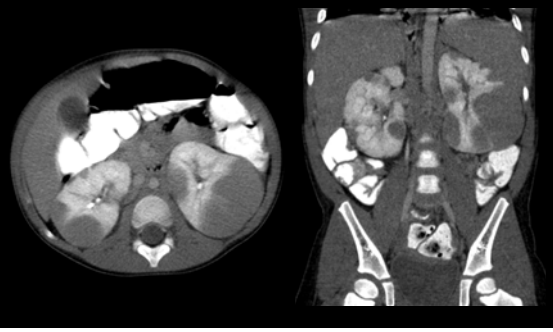
Nephroblastomatosis

- US = well-defined ovoid homogeneous hypoechoic mass, <2cm
- CT = soft tissue mass hypoenhancing compared to normal kidney
- MRI = T1 iso-, T2 iso-hyper intense soft tissue mass
- Concerning = spherical, >3cm, heterogeneous, invasive

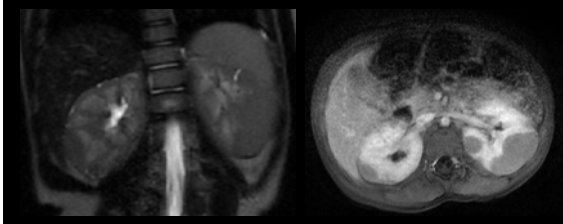
Nephroblastomatosis

- Malignant association:
  - Incidental nephroblastomatosis in ~1% of infants
  - Nephroblastomatosis transformation rate to Wilm's tumour reported at 1-3%
  - Nephroblastomatosis accounts for ~35% of Wilm's
- Frequent screening therefore recommended – q3-4 months until 5-7 yrs with US
- Enlarging lesions are usually treated as early-stage Wilm's tumour with chemotherapy or surgical resection
- Other lesions involute over time

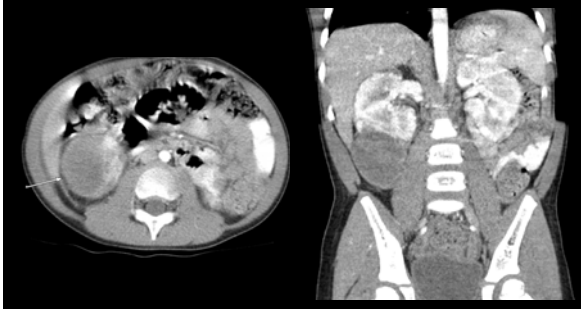
Nephroblastomatosis



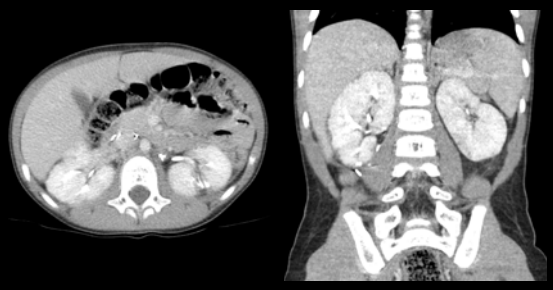
Nephroblastomatosis



Nephroblastomatosis



Nephroblastomatosis



Paediatric Focal Nodular Hyperplasia

- Focal nodular hyperplasia (FNH) is a rare tumour in children (incidence 0.02%)
- Relatively recently, high rates of FNH were identified developing among children who suffered from childhood cancers

Paediatric Focal Nodular Hyperplasia

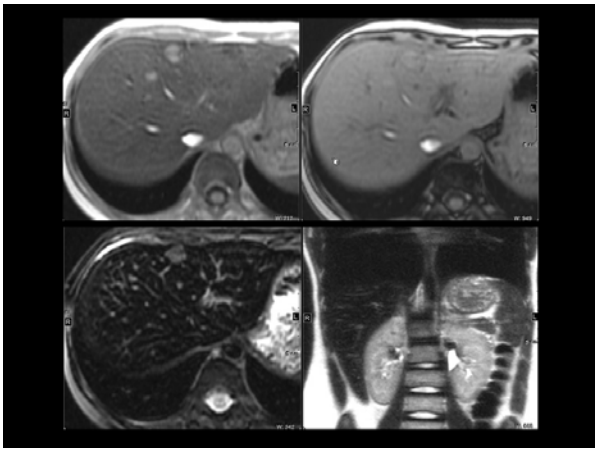
- An association has been proposed between FNH and childhood stem cell transplant
  - Rates have been reported up to 5.2% of this population (260x higher than the general rate)
- Lesions are usually first found on surveillance US as non-specific masses; MRI then recommended for characterization

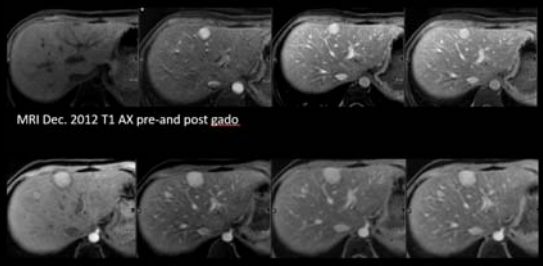
Paediatric Focal Nodular Hyperplasia

- FNH in this population are generally atypical
  - Smaller and more numerous (usually >1 FNH / patient)
  - Less likely to have a central scar
  - Less likely to be occult on T1- and T2-weighted sequences
  - As per usual, avid arterial enhancement, but often maintain enhancement through all phases
  - Often enlarge (slightly) over time

Paediatric Focal Nodular Hyperplasia

- Atypical appearance of FNH in the post-treatment paediatric oncology patient can create a diagnostic dilemma
  - Underlying concern = metastases
- Although FNH in this population are often atypical, the key feature is arterial hyperenhancement
- Biopsy may still be required if lesions are deemed indeterminate





Summary

- Radiology is a challenging specialty!
  - Multiple solid lesions are not necessarily malignant
- However, benign lesions often have associated morbidity or malignant associations, and aggressive management may be indicated
- Differential diagnosis and clinicopathological correlation are, as always, very important

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