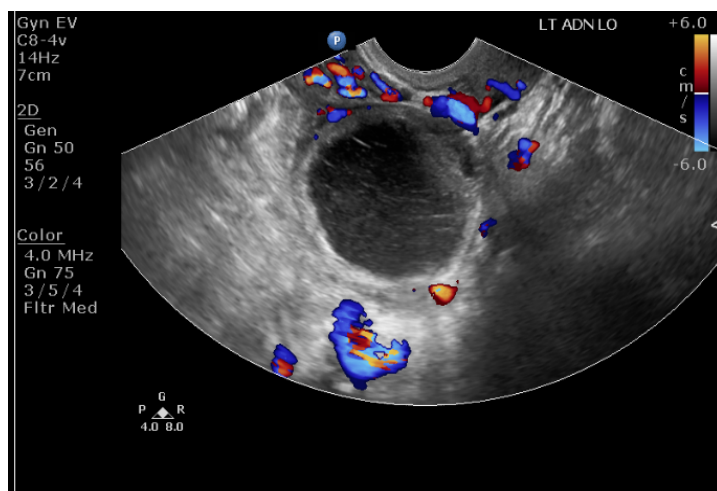


A Radiology Seminar for the NYFHT Physicians



CCMSU Medical Imaging presents on Monday April 3rd 2017

Radiology Management for Family Physicians: How to work up incidental findings on Ultrasound.



Speakers:

Muhammad Munshi, M.D., FRCPC.

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- No financial disclosures

- Simple cystic lesions (follicles) up to 3 cm in reproductive age women are normal findings
- Differentiate simple from complex cystic lesions, the latter requiring different work-up and management
- Need to visualize the entire lesion on U/S to exclude any atypical features of cysts

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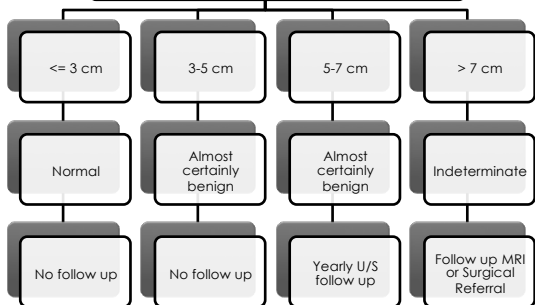
SIMPLE ADNEXAL CYSTS

- > 99 % of simple cysts up to 10 cm are benign:
 - Non-neoplastic
 - Physiologic
 - Paraovarian
 - Paratubal
 - Benign Neoplastic Cysts
 - Serous Cystadenoma
 - Mucinous Cystadenoma
- Rare malignant cysts are usually large, > 7 cm, and in fact not simple cysts
 - Cyst wall is incompletely imaged and a mural nodule was missed

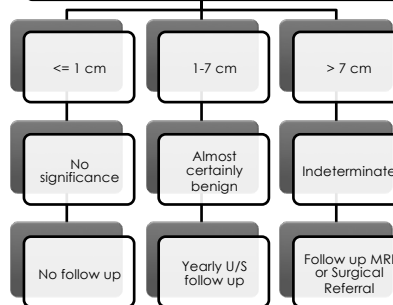
MANAGEMENT OF SIMPLE ADNEXAL CYSTS

- Pre-menopausal
- Post-menopausal
- Reference American College of Radiology Guidelines, September, 2014
 - Guidelines are for asymptomatic women
 - No consensus for how long a lesion should be followed

Asymptomatic Simple Cysts: Premonopausal



Asymptomatic Simple Cysts: Postmenopausal



TAKE HOME POINTS- SIMPLE ADNEXAL CYSTS

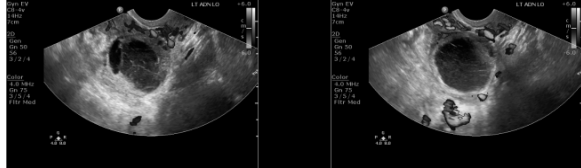
- The vast majority of simple ovarian or paraovarian cysts are benign
- If a cystic lesion is > 7cm, pre or post-menopausal, consider MRI or surgical referral
- Cysts < 7 cm may be followed yearly with U/S or require no follow up depending on size and menopausal status
- Caveat
 - Occasionally a radiology report will deviate from these guidelines
 - If a cystic lesion is not incompletely imaged
 - If there are features not typical of a cyst

COMPLEX CYSTIC ADNEXAL LESIONS

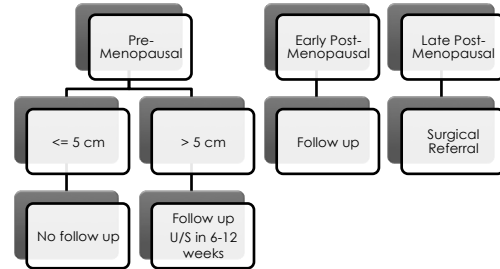
- Benign characteristics
 - Hemorrhagic cyst
 - Endometrioma
 - Dermoid
 - Hydrosalpinx
- Indeterminate characteristics
 - Atypical hemorrhagic lesions, questionable dermoid
 - Thin septations, < 3 mm
 - Nodules without flow
- Worrisome characteristics
 - Thick septations, > 3 mm
 - Nodules with flow

HEMORRHAGIC CYSTS

- Reticular pattern of internal echoes
- +/- solid appearing area with concave margins
- No internal flow

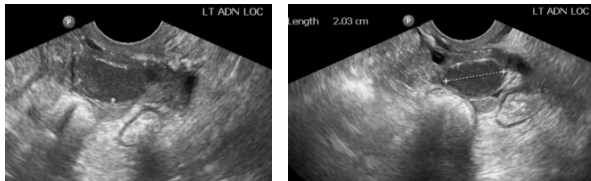


MANAGEMENT OF HEMORRHAGIC CYSTS

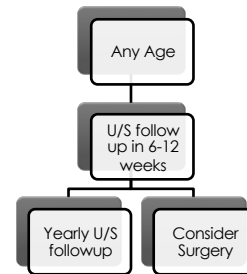


ENDOMETRIOMA

- Homogeneous low level internal echoes
- No solid component
- +/- tiny echogenic foci in wall

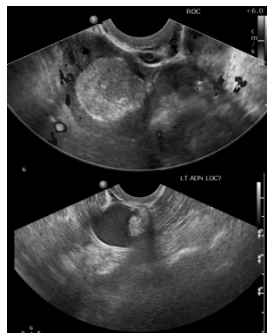


MANAGEMENT OF ENDOMETRIOMA



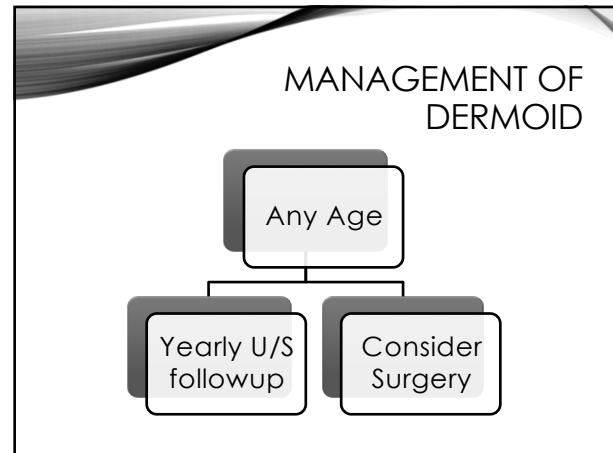
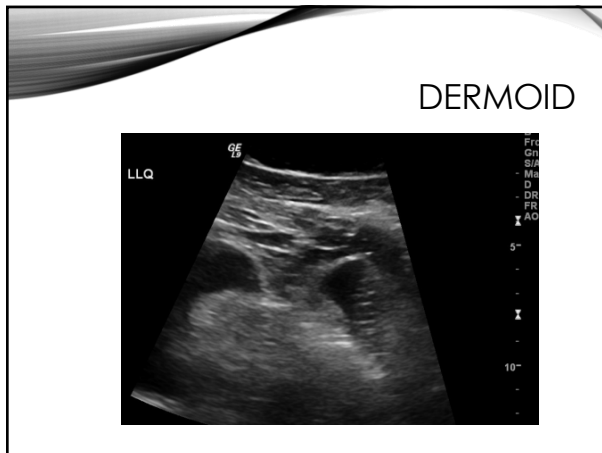
DERMOID

- Focal or diffuse hyperechoic component
- Hyperechoic lines or dots
- Acoustic shadowing
 - Similar to bowel gas
- No internal flow
- Note: MRI/CT may help confirm fat component



DERMOID



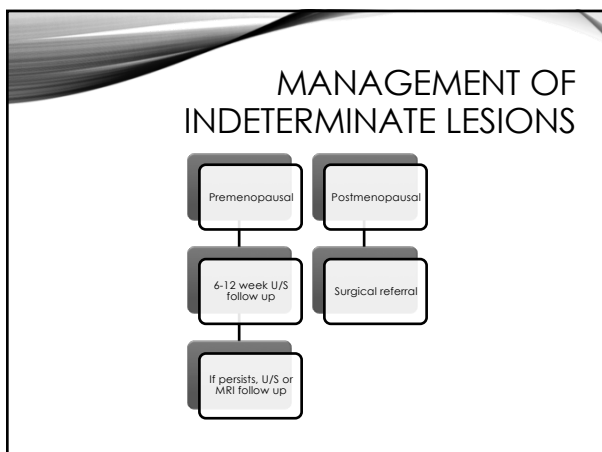


HYDROSALPINX

- Tubular shaped cystic mass
- 'Beads on a string' pattern
- Indentations (waist sign)
- Appears separate from ovary
- Management: As clinically indicated

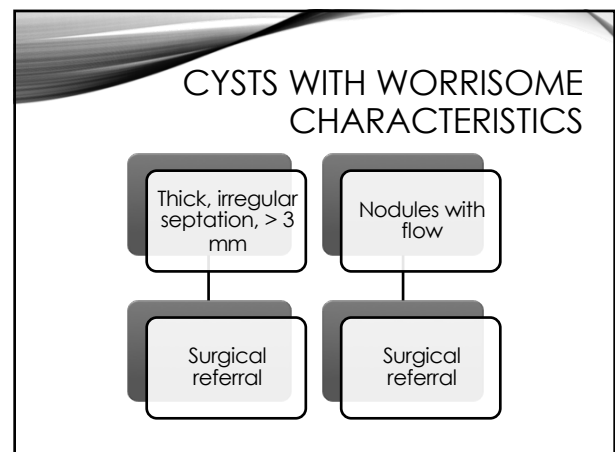
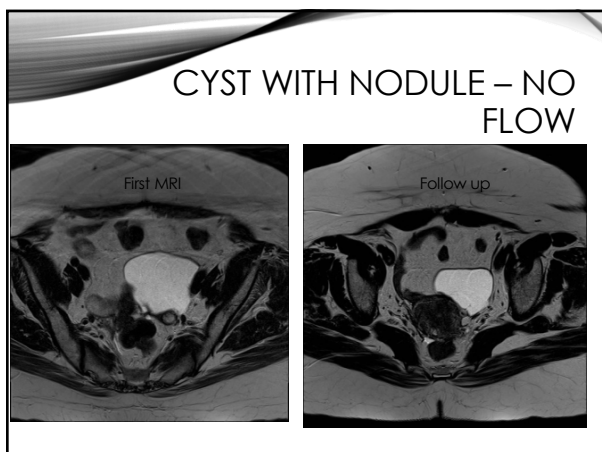
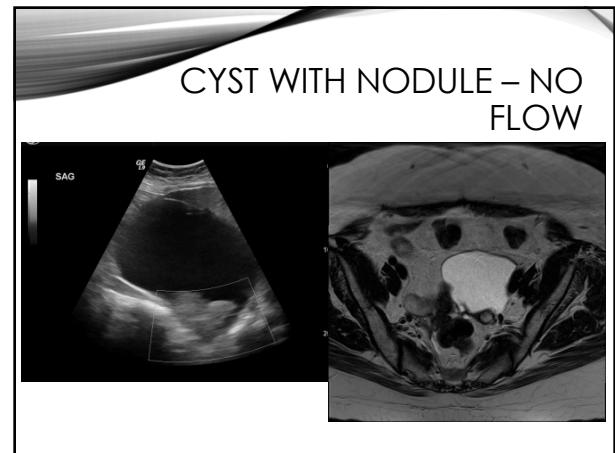
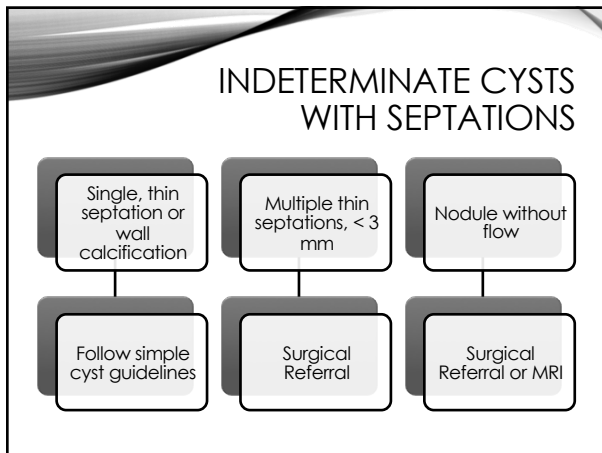
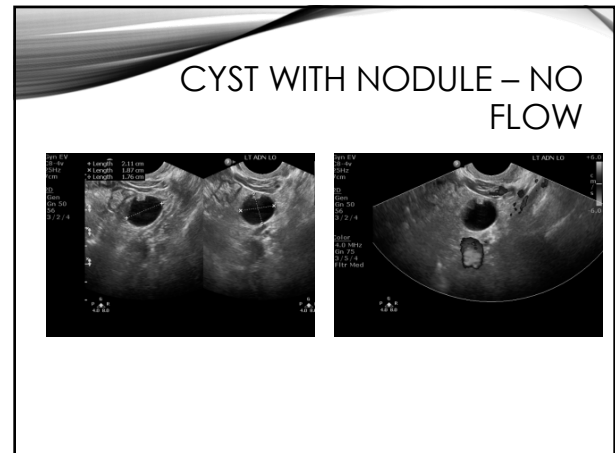
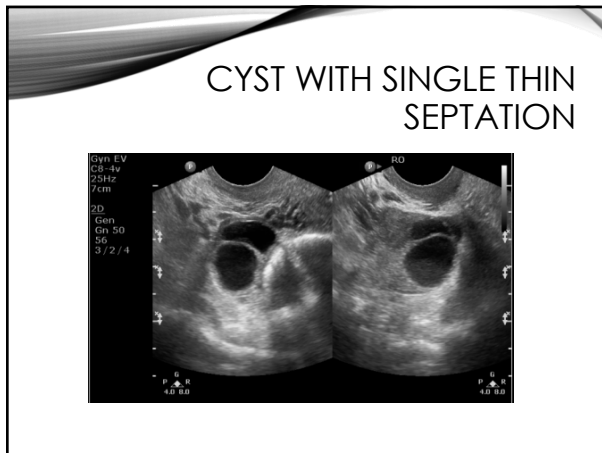
INDETERMINATE COMPLEX CYSTIC LESIONS

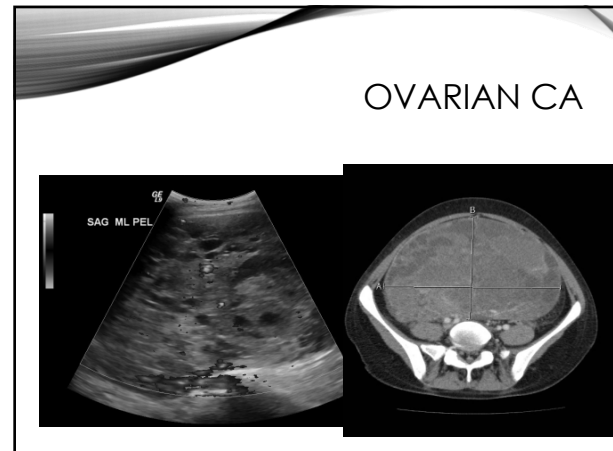
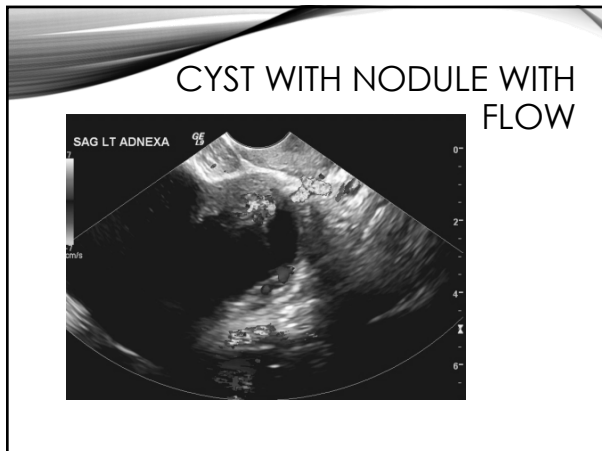
- Suggestive of hemorrhagic cyst, endometrioma or dermoid but not classic



SPECIFIC FEATURES OF INDETERMINATE COMPLEX CYSTIC LESIONS

- Cysts with thin septations, < 3 mm
- Cysts containing nodules without flow



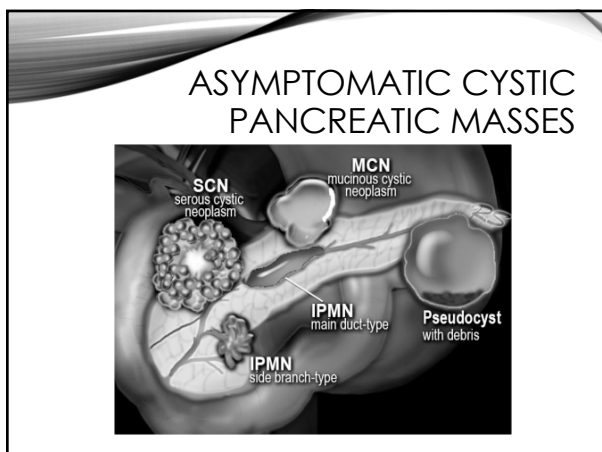


TAKE HOME POINTS – COMPLEX ADNEXAL CYSTS

- Thick septations or nodular foci with flow are concerning and suspicious for malignancy
- When concern regarding malignancy, surgical referral should be performed
- Refer to radiologist guidelines
 - Atypical features may be seen and require follow up or additional imaging

ASYMPTOMATIC CYSTIC PANCREATIC MASSES

- Classification
 - Pseudocysts
 - Common cystic neoplasms
 - IPMN - intraductal papillary mucinous neoplasm
 - SCN - Serous cystic neoplasm
 - MCN - Mucinous cystic neoplas
 - Uncommon cystic neoplasms:
 - SPEN (solid pseudopapillary epithelial neoplasm)
 - Tumors with cystic degeneration
 - adenocarcinoma - neuroendocrine tumor



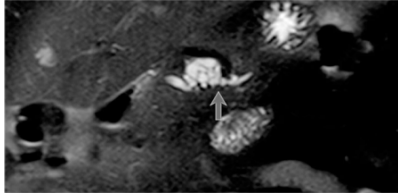
ASYMPTOMATIC CYSTIC PANCREATIC MASSES

- Challenge on U/S
 - Confirm the pancreatic lesion is cystic
 - Additional imaging (MRI/CT) should be considered to confirm cysts and document any septations or nodularity

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ASYMPTOMATIC CYSTIC PANCREATIC MASSES

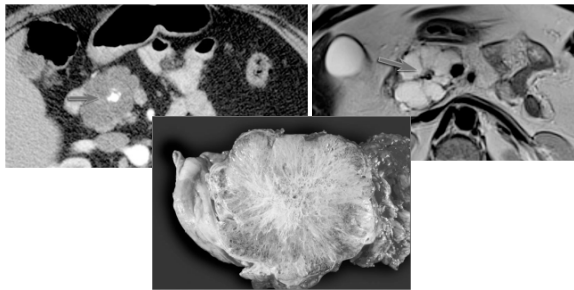
- Challenge on U/S
 - Confirm the pancreatic lesion is cystic
 - Additional imaging (MRI/CT) should be considered to confirm cysts and document any septations or nodularity



ASYMPTOMATIC CYSTIC PANCREATIC MASSES

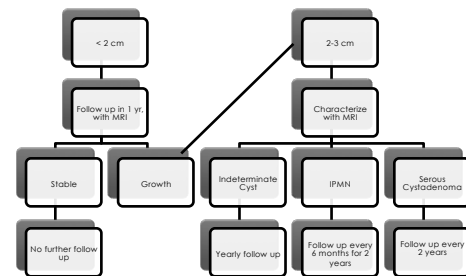
- Overlap in appearances of benign and premalignant lesions
- Serous cystadenoma
 - May have specific characteristics on CT/MRI
 - Microcystic with central scar that may calcify
 - Benign, not premalignant

SEROUS CYSTADENOMA

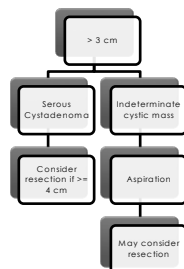


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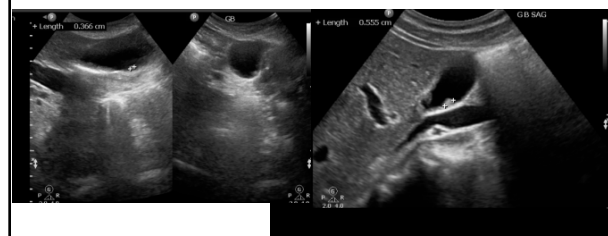
MANAGEMENT OF CYSTIC PANCREATIC MASSES - ACR



MANAGEMENT OF CYSTIC PANCREATIC MASSES - ACR



GALLBLADDER POLYPS



Fixed and Hyperechoic Foci

GALLBLADDER POLYPS

- Incidence 4.3-6.9 %
- Average age at diagnosis = 49
- Slight male predominance (1.15:1)
- Risk factors
 - Congenital polyposis syndromes
 - Peutz-Jeghers, Gardner syndrome
 - Chronic Hep B in Chinese population
- Possible inverse relationship between polyps and stones
 - Polyps may disrupt the formation of stones (?)
- Usually asymptomatic, some with N/V due to obstruction from fragments of cholesterol that detach from the GB mucosa (symptoms do not distinguish benign from malignant polyps)

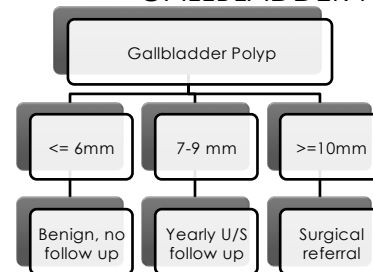
GALLBLADDER POLYPS

- Benign
 - Pseudotumours
 - Cholesterol polyps (60-90% of polyps), < 10 mm
 - Inflammatory polyps (10% of polyps), < 10 mm
 - Cholesterolosis
 - Hyperplasia
 - Epithelial Tumours
 - Adenoma (rare), 5-20 mm, solitary
 - Mesenchymal Tumours
 - Fibroma
 - Lipoma
 - Hemangioma
- Malignant
 - Gallbladder carcinoma – poor prognosis
- U/S cannot distinguish benign from malignant

WHICH POLYPS ARE MALIGNANT

- Malignancy more common > 50 yo
- Polyps > 1-1.5 cm
- Sessile morphology
- Solitary (?)
- Study of 1558 patients with polyps, required 7 years to detect growth of neoplastic polyps
- Tumour markers, Serum CEA and CA 19-9 not reliable
- Primary sclerosing cholangitis

MANAGEMENT OF INCIDENTAL ASYMPTOMATIC GALLBLADDER POLYPS



THANK YOU!

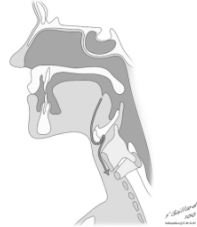
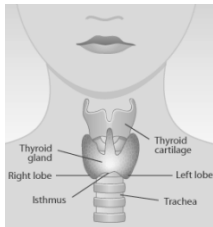
Questions????

Management of Thyroid Nodules

David Widman, M.D. FRCPC
Active Staff Radiologist-Trillium Health Partners
University of Toronto-Clinical Adjunct Lecturer

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MEDICAL IMAGING

Thyroid Anatomy and Ectopic Components



Causes of Benign Nodules

Multinodular	• Goiter or Colloid Adenomas
Thyroiditis	• Hashimoto's Disease (Chronic Lymphocytic)
Cysts	• Colloid, Simple or Hemorrhagic
Follicular Adenomas	• Macrofollicular and Microfollicular
Hurtle Cell Adenomas	• Macro- or Micro- pattern

Causes of Malignant Nodules

Carcinoma	• Papillary-Most common, usually local disease. Good survival. • Follicular-2nd most common, can spread far, good but less good survival. • Others, Hurtle, Anaplastic, etc.
Primary Lymphoma	• Lymphoma
Metastatic Carcinoma	• Breast • Renal • Others
Indeterminate	• Follicular lesion or Lesion of Indeterminate significance

Risk of Thyroid Cancer

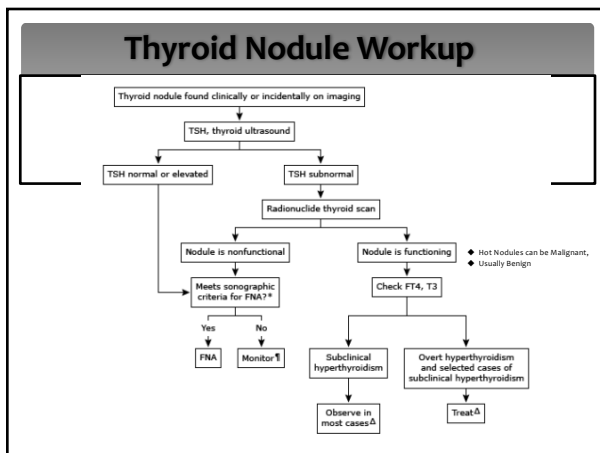
- 4 - 6.5% of all nodules in a non surgical series.
- Annual detection rate of clinically significant thyroid cancers in the general population is 0.004%.
- Higher risk in several groups:
 - Children
 - Adults less than 30 y.o. and older than 60 y.o.
 - Patients with a history of head and neck radiotherapy
 - Family history of thyroid cancer

Thyroid Nodules: Who Has Them

- On ultrasound, 40% of the general population has single or multiple nodules.
- At autopsy, 49% of patients who had clinically normal thyroid glands were found to have 1 or more nodules and of these the incidence of malignancy was 2-4%. In other words, these patients died from something other than thyroid cancer.

Thyroid Nodules Discovery

- Clinical Exam-palpable
- CT scan
- Carotid ultrasound
- PET scan



Thyroid Nodule Management

Sonographic Pattern	US Features	Estimated risk of Malignancy	Consider Biopsy (FNA Cut off size, largest dimension)
High Suspicion	Solid hypoechoic nodule or hypoechoic component of a partially cystic nodule with one or more of the following features: irregular margins (infiltrative, micro-lobulated), micro-calcifications, taller than wide shape, rim calcifications with small extrusive component, extra-thyroidal extension	>70-90%	Recommend FNA @ >1cm
Intermediate Suspicion	Hypoechoic solid nodule with smooth margins without suspicious features as described above	10-20%	Recommend FNA @ >1.5cm
Low Suspicion	Iso-echoic or hyper-echoic solid nodule or partially cystic nodule with eccentric solid areas, without micro-calcifications or other suspicious features as described above	5-10%	Recommend FNA at >1.5cm
Very Low Suspicion	Spongiform or partially cystic nodule with out suspicious features described above	<3%	Consider FNA @ >1.5cm. Observation without FNA is also reasonable
Benign	Purely cystic (No solid Component)	<1%	No Biopsy

Thyroid Nodule Appearance vs. Risk

2015 American Thyroid Association Management Guidelines

Suspicion Level	Estimated Risk (%)	Management
High Suspicion	>70-90%	FNA if >1cm
Intermediate Suspicion	10-20%	FNA if >1cm
Low Suspicion	5-10%	FNA if >1.5cm
Very low Suspicion	<3%	FNA if >2cm
Benign	<1%	No Biopsy

Risk of malignancy ↑

Thyroid Nodule Cancer Risk

Ultrasound Features Associated with Thyroid Cancer	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)
Microcalcifications	26 - 59	86 - 95	24 - 71	42 - 94
Hypoechoic	27 - 87	43 - 94	11 - 68	74 - 94
Irregular margins or no halo	17 - 78	39 - 85	9 - 60	39 - 98
Solid	69 - 75	53 - 56	16 - 27	88 - 92
Intranodule vascularity	54 - 74	79 - 81	24 - 42	86 - 97
More tall than wide	33	93	67	75

Note: Combining these factors improves the positive predictive value of US. For example, a predominantly solid nodule with microcalcifications has a 31.6% likelihood of being cancer, as compared to a predominantly cystic nodule with no calcification, which has a 1.0% likelihood of being cancer.

- ### Thyroid Nodule: FNA results
- Most nodules with a non-diagnostic cytology are benign. Non-diagnostic samples occur in 2-16% of FNAs of which 7-26% were eventually resected.
 - The frequency of malignancy among all initially non-diagnostic samples was 2-4% of which 9-32% were resected.

- ### Thyroid Nodule: FNA Results
- Sonographic characteristics can be used to stratify risk of malignancy in non-diagnostic samples.
 - Of 104 nodules with 2 non-diagnostic samples, thyroid cancer was eventually found in 25% of nodules with micro-calcifications, irregular margins, taller than wide or hypo-echogenic and only in 4% lacking these features.
 - Cystic lesions often yield non-diagnostic results and the lesions are often benign.

Thyroid Nodule Follow up

- **Monitoring of nodules that do NOT meet FNA criteria** — Nodules that do not meet sonographic criteria for FNA should be monitored. The frequency of evaluation depends upon the sonographic features of the nodules. *We perform periodic ultrasonography initially at:*
 - 6 to 12 months for sub-centimeter nodules with suspicious characteristics
 - 12 to 24 months for nodules with low to intermediate suspicion on ultrasound
 - >24 months for very-low-risk nodules
 - Subsequent ultrasounds can be obtained at increasing intervals over time, depending upon stability.
 - Nodules that enlarge significantly require a repeat FNA, and sub-centimeter nodules that grow to >1 to 2 cm require a biopsy depending upon their size and ultrasound characteristics

Radiological Guidance

- The radiologist interprets the images and should provide management guidance based on nodule appearance. Clinical history may increase risk of malignancy.
- There is both inter- and intra- observer variability in interpretation and follow up recommendations.
- Management of non-diagnostic biopsy results is controversial. May include repeat FNA, Core Biopsy and continued follow up.
- Nuclear medicine is not used to differentiate benign from malignant nodules.

Management of Renal Cystic and Complex Lesions

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University of Toronto-Clinical Adjunct Lecturer

Renal Anatomy

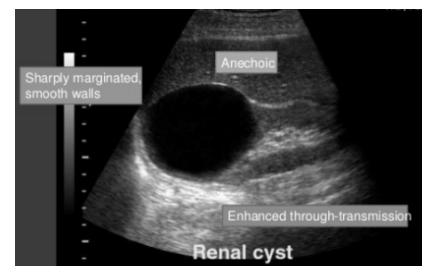


Bosniak Classification: For Cystic Renal Lesions

- I - Simple cyst** with a hairline-thin wall.
 - No septa, calcifications, or solid components.
 - Water attenuation, no enhancement.
- II - Septa:** few hairline-thin in which not measurable enhancement may be appreciated.
 - **Calcification:** fine or a short segment of slightly thickened may be present in the wall or septa.
 - **High-attenuation:** uniform in lesions (< 3cm) that are sharply margined and do not enhance.
- IIIF - Septa:** multiple hairline-thin in which not measurable enhancement of septum or wall is appreciated.
 - **Minimal thickening of wall or septa,** which may contain calcification, that may be thick and nodular, but no measurable contrast enhancement.
 - No enhancing soft-tissue components.
 - **Intrarenal:** totally intrarenal nonenhancing high-attenuating renal lesions > 3 cm
- III - Measurable enhancement**
 - Cystic mass with thickened irregular or smooth walls or septa in which measurable enhancement is present
- IV - Enhancing soft-tissue components**
 - Clearly malignant cystic masses that can have all of the criteria of category III but also contain distinct enhancing soft-tissue components independent of the wall or septa

Bosniak I, II	→	Ignore
Bosniak II F	→	Follow
Bosniak III, IV	→	Excise

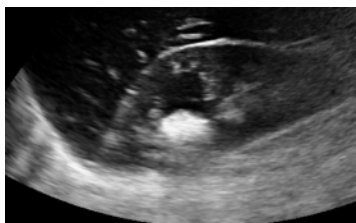
Bosniak: Type I - Always benign



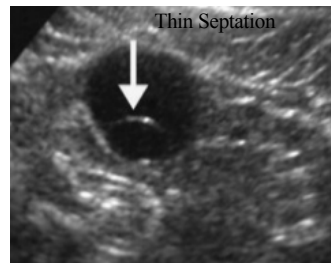
If these 3 criteria met, no further follow up required.

Benign: Milk of Calcium Cyst

Represent calcium precipitate in a simple cyst or calyceal diverticulum that has lost communication with the collecting system.



Bosniak Type II: Benign minimally complicated cyst



Bosniak Type III: Cystic Lesion -May be Malignant

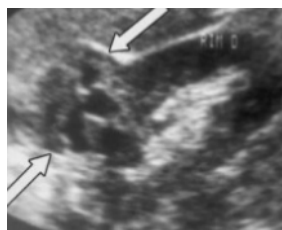


Cyst with Mural Nodule



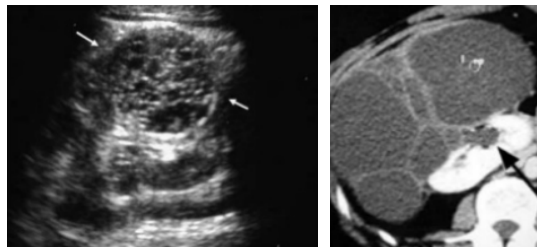
Complex cyst with thick nodular septation

Bosniak Type IV: Mixed Solid and Cystic mass Suspicious for Malignancy



Multilocular Cystic Renal Lesions

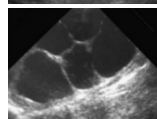
Multilocular Cystic Nephroma- Almost always benign.
Hard to differentiate from cystic renal cell carcinoma.



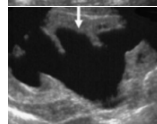
Parapelvic Cysts vs. Hydronephrosis



-Benign parapelvic cysts or renal sinus cysts
-Develop from lymphatics



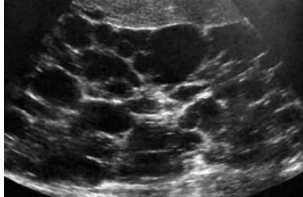
-Severe Hydronephrosis resembling benign cysts



-Moderately Severe Hydronephrosis

Polycystic Kidney Disease

- ◆ Adult or Autosomal Dominant- Genetic Link.
- ◆ Can develop malignancy, but usually solid rather than cystic.
- ◆ Have bilateral enlarged kidneys.
- ◆ Risk of associated cerebral Berry Aneurysms, 6-16%
- ◆ Screen for aneurysms with MRI
- ◆ Other organs affected with cysts, liver, seminal vesicles, etc.

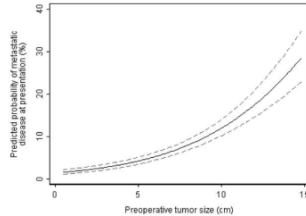


Cystic Renal Lesion Work Up

- ◆ Bosniak Type I: Simple Renal Cysts on Ultrasound.
 - ◆ No further work up or follow up required.
- ◆ Bosniak Type II: Minimally complicated cysts.
 - ◆ Benign. May recommend further imaging as Bosniak Criteria include CT/MRI characteristics.
- ◆ Bosniak Type IIF, III, IV: Complicated cystic lesions.
 - ◆ May be malignant. Require CT/MRI to better characterize

Risk of Metastatic Renal Cell Carcinoma vs. Tumour Size

- ◆ The Risk of metastatic disease for patients with renal cell carcinomas less than 3cm is negligible.
- ◆ Risk of metastatic disease increases with tumour size
- ◆ Intra- and inter-observer variability



Questions and Answers

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