

“Ultrasound after the CT, when is it indicated?”

Case Based Guide to AbdominoPelvic Imaging
for the Primary Care Physician

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DISCLOSURES

- * None

OUTLINE

- * Guidelines for Imaging
 - * Strength and limitations of US and CT
 - * Which test first?
- * Case scenarios of “Dos and don'ts of ultrasound after CT”
- * When to go from US to MRI directly

Strenght and limitations of US and CT

ULTRASOUND

- | | |
|---|---|
| <ul style="list-style-type: none">* Strengths:* Fast, real-time imaging* Bedside procedure<ul style="list-style-type: none">* Able to talk to the patient while doing the exam* Look at the site of symptoms* Can assess vascularity* No ionizing radiation* Limited discomfort with no other significant side effect | <ul style="list-style-type: none">* Good tissue contrast<ul style="list-style-type: none">* Especially between fluid and soft tissue* (Good) spatial resolution<ul style="list-style-type: none">* Depends on body habitus* Depends how close you can get to the structure in question – EV, TR |
|---|---|

ULTRASOUND

- * Limitations
 - * Can't penetrate air or bone
 - * Limited field of view
 - * Limited depth of imaging
 - * Level of patient co-operation
 - * Ability to hold breath
 - * Ability to move
 - * Ability to tolerate pressure from ultrasound probe

CT

- * Strengths
 - * Excellent spatial resolution
 - * Good tissue resolution
 - * Full field of view
 - * Images can be reconstructed in multiple planes
 - * Usually no penetration issues
 - * Bone and air are not a problem
 - * Relatively quick

CT

- * Limitations
 - * Cannot do by the bedside
 - * Patient has to lie still
 - * Breath hold needed for Chest and Abdominal imaging
 - * Tissue resolution limited without IV contrast
 - * May not be given due to renal function issues
 - * Some protocols don't need IV contrast (e.g. renal colic)
 - * Artifact from metallic hardware
 - * Radiation dose

Which test first?

CAR GUIDELINES

- * CAR has published "Diagnostic Imaging Referral Guidelines"
- * Imaging recommendations for various clinical scenarios are listed
- * The strength of evidence for those imaging options also listed with dose information
- * Similar to the ACR Appropriateness Criteria

Canadian Association of Radiology DI Referrals & Appropriateness

<https://car.ca/patient-care/referral-guidelines/>



American College of Radiology (ACR) Appropriateness criteria

<https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria>



Ask your radiologist colleague is also an option and/or give comments in the indication section

ULTRASOUND

- * Uses:
 - * **Abdominal/ Pelvic imaging**
 - * First line imaging for biliary issues
 - * First line imaging for female pelvis
 - * First line imaging for scrotum
 - * Often first line imaging for renal/bladder issues
 - * Hydronephrosis, microhematuria
 - * HCC screening, liver elastography
 - * AAA screening
 - * **Easiest modality to get a "quick look"**

THE "QUICK LOOK" TEST

- * For Abdomen/Pelvis cases
 - * Ultrasound typically the most accessible test
 - * Often used to screen non-specific symptoms
 - * Will miss bowel, retroperitoneal issues
 - * Depending on body habitus, CT would be the better option



RULE OF THUMB

If it is harder to do the physical examination of a patient, it will be hard to do the ultrasound

CT

* Uses

* Abdomen/Pelvis

- * Bowel imaging (replaced most Fluoroscopy studies)
- * Renal colic*
- * Solid organ imaging*
- * CTA of Aorta, renal vessels, mesenteric vessels
- * Best for workup of FMD and renal artery stenosis

MR

* Uses

* Abdomen/Pelvis

- * Solid organ assessment
- * Excellent for liver, pancreas, bile ducts (MRCP)
- * Elastography (limited access)
- * Bowel (MR Enterography)
- * Female Pelvis

* Vascular

- * MRA (if CT not feasible)
- * Uterine AVM
- * Pelvic Congestion Syndrome
- * Post uterine artery embolization assessment

Case Scenarios

Dos and Don'ts of
ultrasound after CT

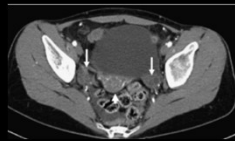
US after CT

1. GYNE - Incidental finding, usually in the female pelvis, on CT leads to request for follow-up US
Reimaging the Female Pelvis with Ultrasound After CT – General Principles. Patel and Dubinsky, Ultrasound Quarterly, vol.23 (3), 2007
2. CYST- Confirm cystic nature of a solid organ lesion
3. BILIARY - Gallstone assessment
Things We Do for No Reason™: Ultrasonography after an initial negative CT in patients presenting with acute abdominal or pelvic pain. Cunningham, JM. J Hosp Med. 2022;
4. PROCEDURES- Ultrasound guided procedures
5. VASCULAR – Venous thrombosis

1. Ultrasound after CT- GYNE

Don't do it

- * Gyne structures look normal in the acute setting*



Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky, Ultrasound Quarterly, vol.23(3), 2007

1. Ultrasound after CT- GYNE

Don't do it

- * Gyne structures look normal
- * CT shows an abnormality with a characteristic appearance
- * Physiologic cyst
- * Benign cystic teratoma (Dermoid cyst)



Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky, Ultrasound Quarterly, vol.23(3), 2007

1. Ultrasound after CT- GYNE

Don't do it

- * Gyne structures look normal
- * CT shows and abnormality with a characteristic appearance
- * Lesion is within the myometrium
 - * Fibroid

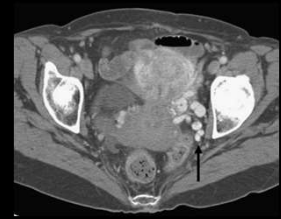


Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky. Ultrasound Quarterly, vol. 23(3), 2007

1. Ultrasound after CT- GYNE

Don't do it

- * Gyne structures look normal
- * CT shows and abnormality with a characteristic appearance
- * Lesion is within the myometrium
- * Ultrasound won't add anything
 - * Enlarged adnexal vessels



Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky. Ultrasound Quarterly, vol. 23(3), 2007

1. Ultrasound after CT- GYNE

Do it

- * Clarify relationship of lesion with the ovary
 - * Exophytic ovarian cyst

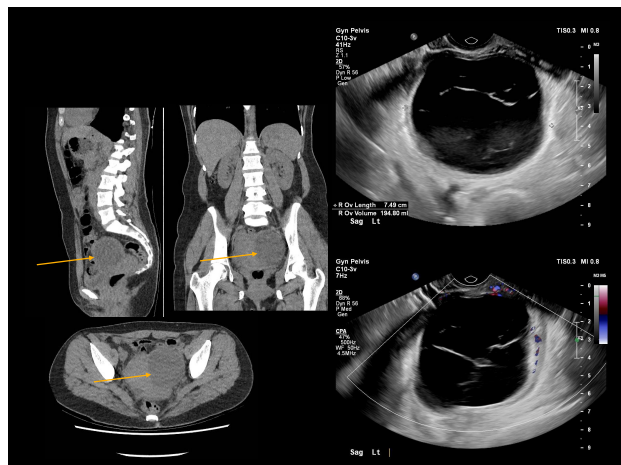


Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky. Ultrasound Quarterly, vol. 23(3), 2007

1. Ultrasound after CT- GYNE

Do it

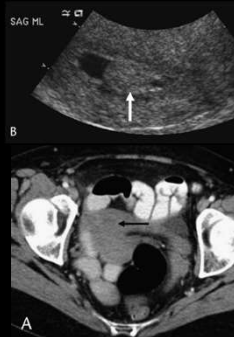
- * Clarify relationship of lesion with the ovary
- * Clarify vascularity (or lack thereof) of a lesion (e.g. if CT was done without contrast)
 - * Hemorrhagic ovarian cyst



1. Ultrasound after CT- GYNE

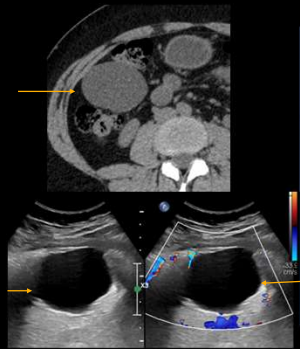
Do it

- * Clarify relationship of lesion with the ovary
- * Clarify vascularity (or lack thereof) of a lesion (e.g. if CT was done without contrast)
- * Evaluate a finding that would be better assessed with ultrasound
 - * Endometrial polyp



Reimaging the Female Pelvis With Ultrasound After CT – General Principles. Patel and Dubinsky. Ultrasound Quarterly, vol. 23(3), 2007

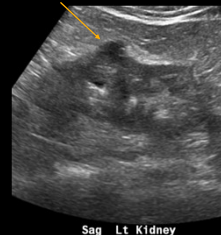
2. Ultrasound after CT- CYST



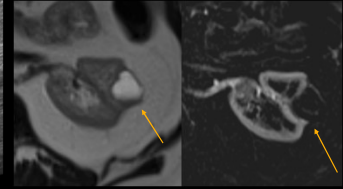
Do it

- * Confirm the cystic nature of a lesion identified on CT (often unenhanced)

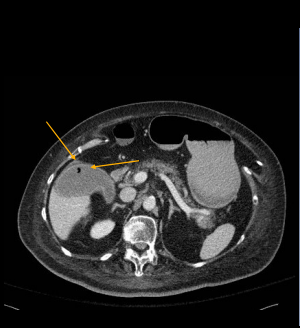
- * US is often useful for presumed cystic renal lesion
- * If US technically challenging, MRI might be the next best step as it allows the use of subtraction images



Sag Lt Kidney



3. Ultrasound after CT- BILIARY



Do it

- * Confirm the presence of gallstones



3. Ultrasound after CT- BILIARY

Don't do it

Abdominal/pelvic ultrasonography after an initial negative CT

Choosing Wisely: Things We Do for No Reason

<p>Why you might consider an abdominal ultrasound after a negative CT</p> <p>Many providers believe that a CT lacks sensitivity for acute biliary or pelvic pathology such as acute cholecystitis or ovarian torsion.</p>	<p>Why ordering an ultrasound after a negative CT is unnecessary</p> <p>While US is more sensitive for detecting gallstones, sensitivity and specificity for detecting acute cholecystitis are comparable between US and CT.</p>	<p>What you should do instead</p> <p>Obtain US if a patient develops new or evolving RUQ or pelvic pain, especially if more than 48 hours have passed since the CT.</p>
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Journal of Hospital Medicine

Gunningham JM et al. Feb 2021
Visual Abstract by @LannaFide

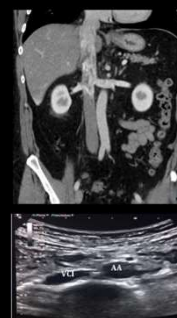
4. Ultrasound after CT- PROCEDURE



Do it

- * Guidance for procedures
- * Can help target non-necrotic portions of tissue
- * Allows identification of a safe path to the target

4. Ultrasound after CT- VASCULAR



Do it

- * Contrast flow phenomenon
- * Can look like a clot or can prevent the assessment of a venous clot

When to go from US to MRI directly?

THE "EXTRA" TEST FROM ULTRASOUND

- * For Abdomen cases
 - * When focal lesion detected in liver, GB or pancreas*
 - * Would recommend MR over CT
 - * MRCP better than CT for looking at biliary tree
 - * For renal lesions both may be required
 - * CT still the mainstay for metastatic work up
 - * If US technically challenging or issues found in the uterus or adnexa, MR is the next best test

KEY MESSAGE

If patient is post-menopausal and ovarian lesion looks worrisome on ultrasound, DO NOT delay Gyne consult for MR

**May need staging CT instead **

ACR O-Rads criteria

IN CONCLUSION

- * Strive to do the most appropriate study first
 - * Use the available guidelines
 - * The more information we get, the more tailored the examination will be
 - * Not always possible in reality
- * Instances where a second modality is needed to make the diagnosis/guide treatment
- * Common scenarios where US is used after CT:
 - * Assess the female pelvis
 - * Confirm the cystic nature of a lesion
 - * Assess the gallbladder/biliary tree
 - * Assess for a venous thrombosis

THANKS!

QUESTIONS?