Gynecologic Imaging:

Ultrasound vs CT vs MRI

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No disclosures

Outline

- Modalities
  - Transabdominal and transvaginal ultrasound (TVS)
- Abnormal uterine bleeding (AUB)
- Ovarian cysts
  - Management of ovarian and other adnexal cysts
  - How to manage adnexal incidentalomas seen on CT or MRI

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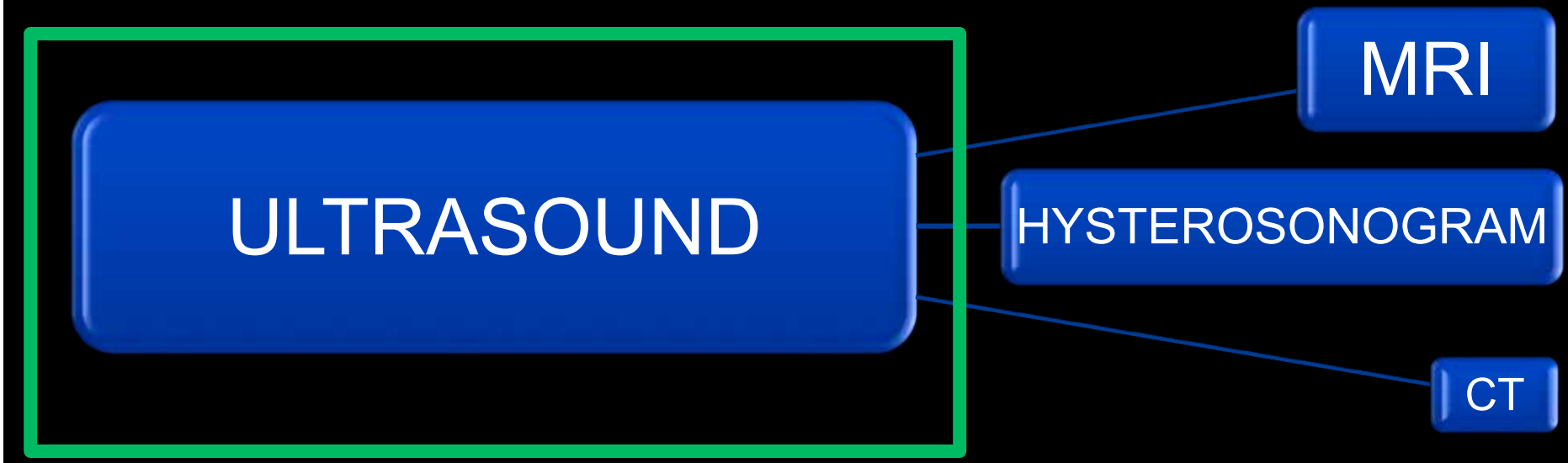
Ultrasound vs MRI vs CT



Indications for pelvic ultrasound

- Pelvic pain
- Evaluation of pelvic mass
- Endocrine
- Dysmenorrhea
- Amenorrhea
- AUB
- Delayed menses
- Infertility patients
- PID
- Congenital uterine anomaly
- Postoperative
- IUD location
- Screening in high-risk patients
- Incontinence or pelvic organ prolapse
- …..

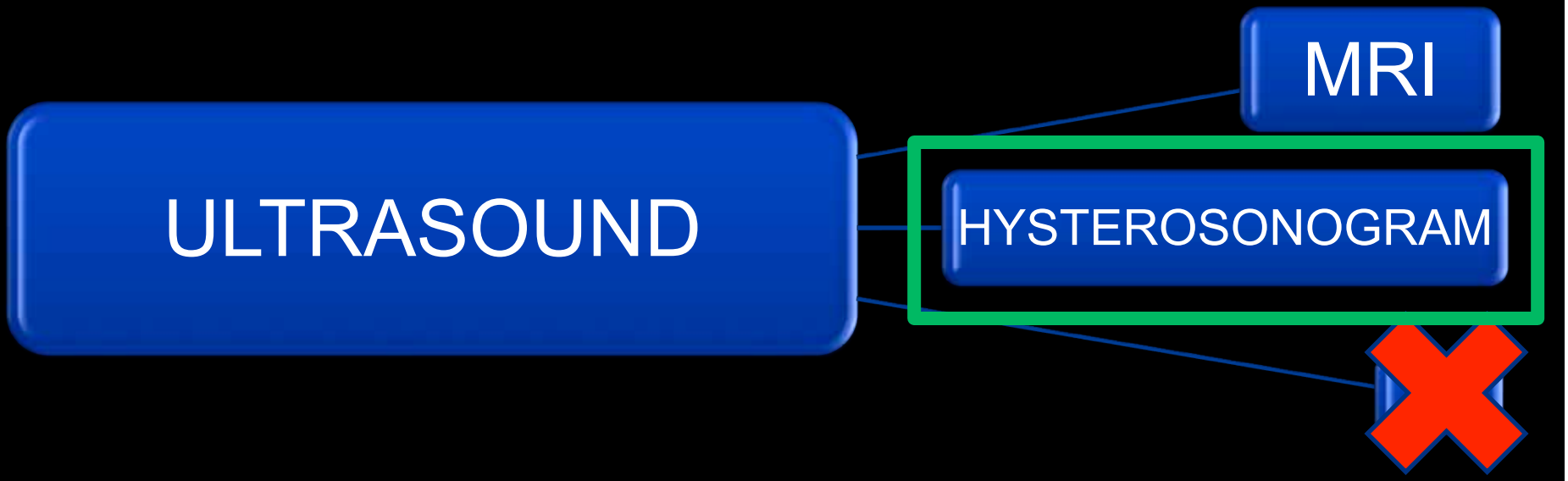
AIUM Practice Guideline for the Performance of Ultrasound of the Female Pelvis. J Ultrasound Med 2014;33: 1122-1130.

Clinical information pertinent to female pelvis sonography

- Age
- Last menstrual period
- Relevant signs and symptoms
- Patient hormonal status (oral contraceptives, hormone replacement therapy, fertility drugs)
- Family history of cancer, personal history of pelvic surgery, results of prior imaging studies

AIUM Practice Guideline for the Performance of Ultrasound of the Female Pelvis. J Ultrasound Med 2014;33: 1122-1130.

Ultrasound vs MRI vs CT



CT:

- Not indicated for evaluation of the pelvic organs
- Staging for already diagnosed pelvic malignancy

SIS vs transvaginal sonography

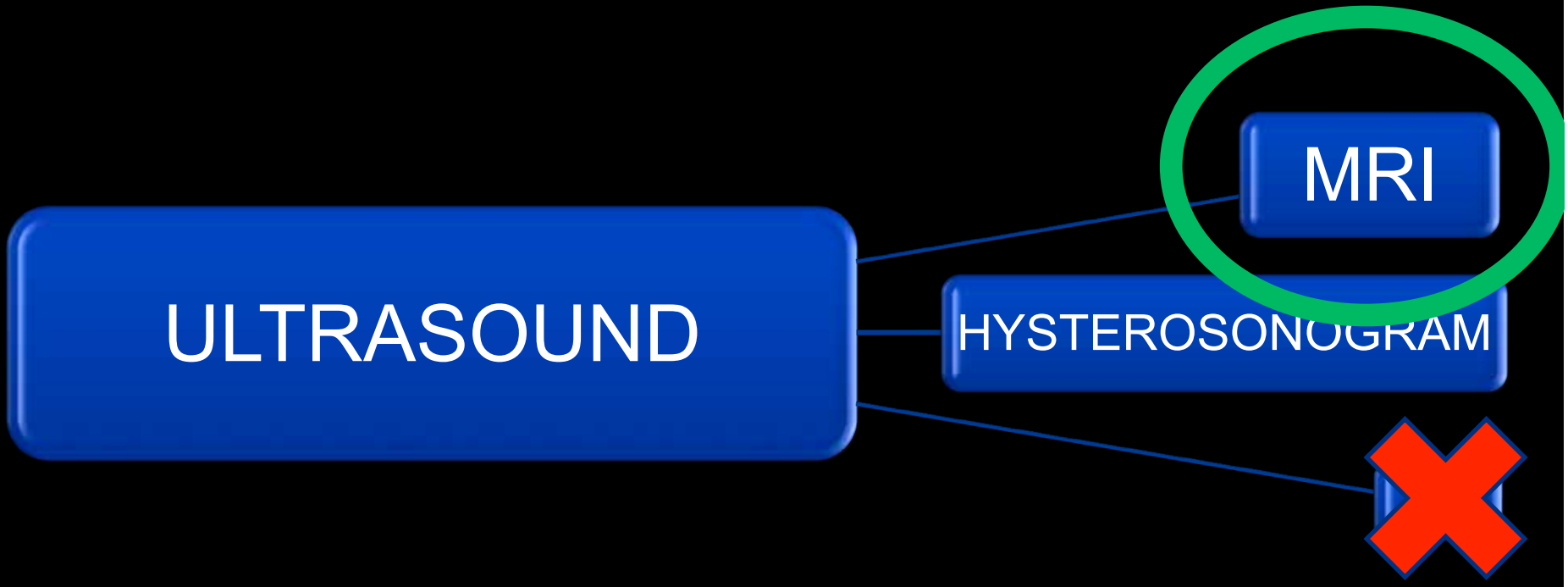
- Invasive procedure, but not has invasive as hysteroscopy
- A 5F catheter is placed through the cervix followed by distension of the uterine cavity with saline during real-time imaging
- Note: can be unsuccessful in postmenopausal patients or with history of prior cervical procedure associated with scarring or stenosis

SIS indications

- AUB
- Uterine cavity, especially for myomas, polyps, and synechiae
- Abnormality detected on TVS (focal or diffuse endometrial or intracavitary abnormalities)
- Congenital abnormalities of the uterus
- Infertility
- Recurrent pregnancy loss

AIUM practice guideline for the performance of sonohysterography. J Ultrasound Med 2012;31: 165-172.

Ultrasound vs MRI vs CT



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Abnormal uterine bleeding

PALM-COEIN Classification system for AUB in reproductive-aged women (FIGO classification system)

PALM: Structural causes

- Polyp
- Adenomyosis
- Leiomyoma
- Malignancy & hyperplasia

COEIN: Nonstructural causes

- Coagulopathy
- Ovulatory dysfunction
- Endometrial
- Iatrogenic
- Not yet classified

FIGO classification system (PALM-COEIN) for causes of abnormal uterine bleeding in nongravid women of reproductive age. International Journal of Gynecology and Obstetrics 2011;113: 3-13.

Abnormal uterine bleeding

- First line imaging: pelvic ultrasound both abdominal and transvaginal (A)
- Second line imaging: hysterosonography or hysteroscopy can be suggested when ultrasound suggests an intrauterine abnormality (or when medical treatment fails after 3 to 6 months) (B)
- MRI: is not recommended as a first-line procedure for AUB (A), but can be used afterwards if ultrasound reveals:
  - bulky fibroid uterus (to map the fibroids) (B)
  - adenomyosis is suspected (B)
  - can also provide some assessment of the endometrium if not well seen on ultrasound or HSG not amenable (C)

Clinical practice guidelines on menorrhagia: management of abnormal uterine bleeding before menopause. European Journal of Obstetrics & Gynecology and Reproductive Biology 2010;152: 133-137.

SIS vs transvaginal sonography

- Increased sensitivity for detection of polyp on SIS vs TVS

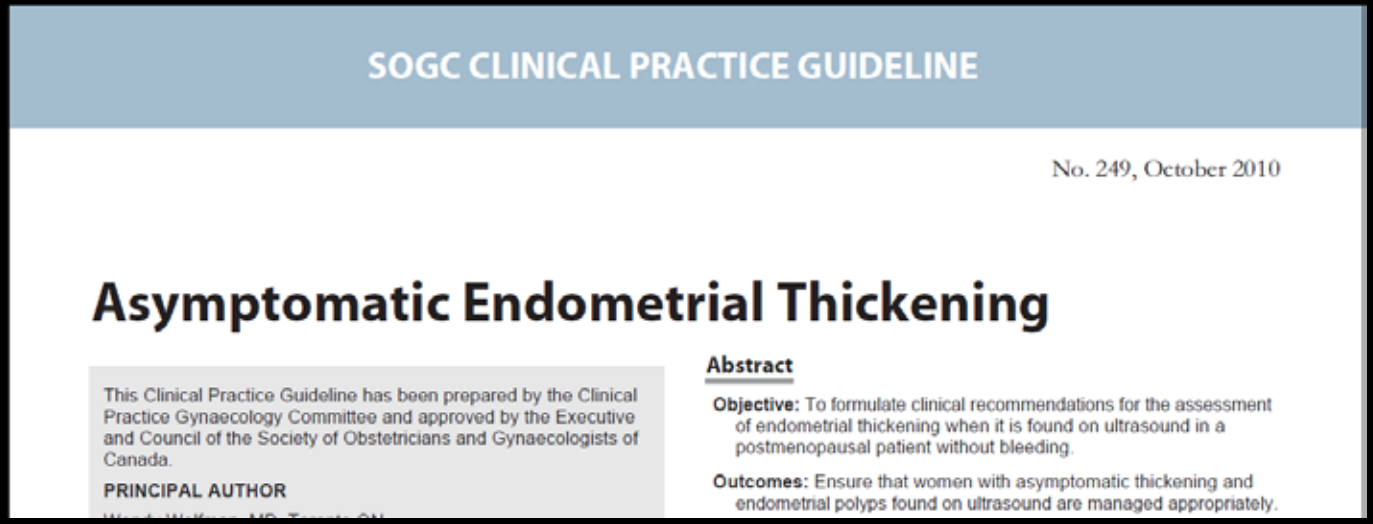
Table 2 Sensitivity, specificity, positive and negative predictive values

		Sensitivity (%)	Specificity (%)
Polyp	TVS	21.9	93.8
	SIS	87.5	95.9
Myoma	TVS	90.9	96.6
	SIS	100	98.3
Adenomyosis	TVS	55.6	88.9
	SIS	88.9	95.8

Sonohysterography versus transvaginal sonography for screening of patients with abnormal uterine bleeding. International Journal of Gynecology and Obstetrics 2007;96: 20-23.

Asymptomatic endometrial thickening

- SOGC Clinical Practice Guideline 2010
- Endometrial thickening found on ultrasound in postmenopausal patient without bleeding



SOGC CLINICAL PRACTICE GUIDELINE

No. 249, October 2010

Asymptomatic Endometrial Thickening

This Clinical Practice Guideline has been prepared by the Clinical Practice Gynaecology Committee and approved by the Executive and Council of the Society of Obstetricians and Gynaecologists of Canada.

PRINCIPAL AUTHOR

Abstract

Objective: To formulate clinical recommendations for the assessment of endometrial thickening when it is found on ultrasound in a postmenopausal patient without bleeding.

Outcomes: Ensure that women with asymptomatic thickening and endometrial polyps found on ultrasound are managed appropriately.

Asymptomatic Endometrial Thickening. J Obstet Gynaecol Can 2010;32: 990-999.

SOGC Clinical Practice Guideline

- Transvaginal ultrasound should not be used as screening for endometrial cancer.
- Endometrial sampling in a postmenopausal woman without bleeding should not be routinely performed.
- Indications for tissue sampling of the endometrium in bleeding postmenopausal women of endometrial thickness of greater than 4 to 5 mm should not be extrapolated to asymptomatic women.
- Woman with endometrial thickening or other positive findings on ultrasound (increased vascularity, inhomogeneity of endometrium, thickened endometrium over 11mm) should be referred to gynecologist for further investigation.
- In asymptomatic women on tamoxifen, a routine ultrasound for endometrial thickening should not be performed.
- Not all postmenopausal women who have asymptomatic polyps require surgery (should take into consideration size of polyp, age, and other risk factors).

Asymptomatic Endometrial Thickening. J Obstet Gynaecol Can 2010;32: 990-999.

Postmenopausal endometrium

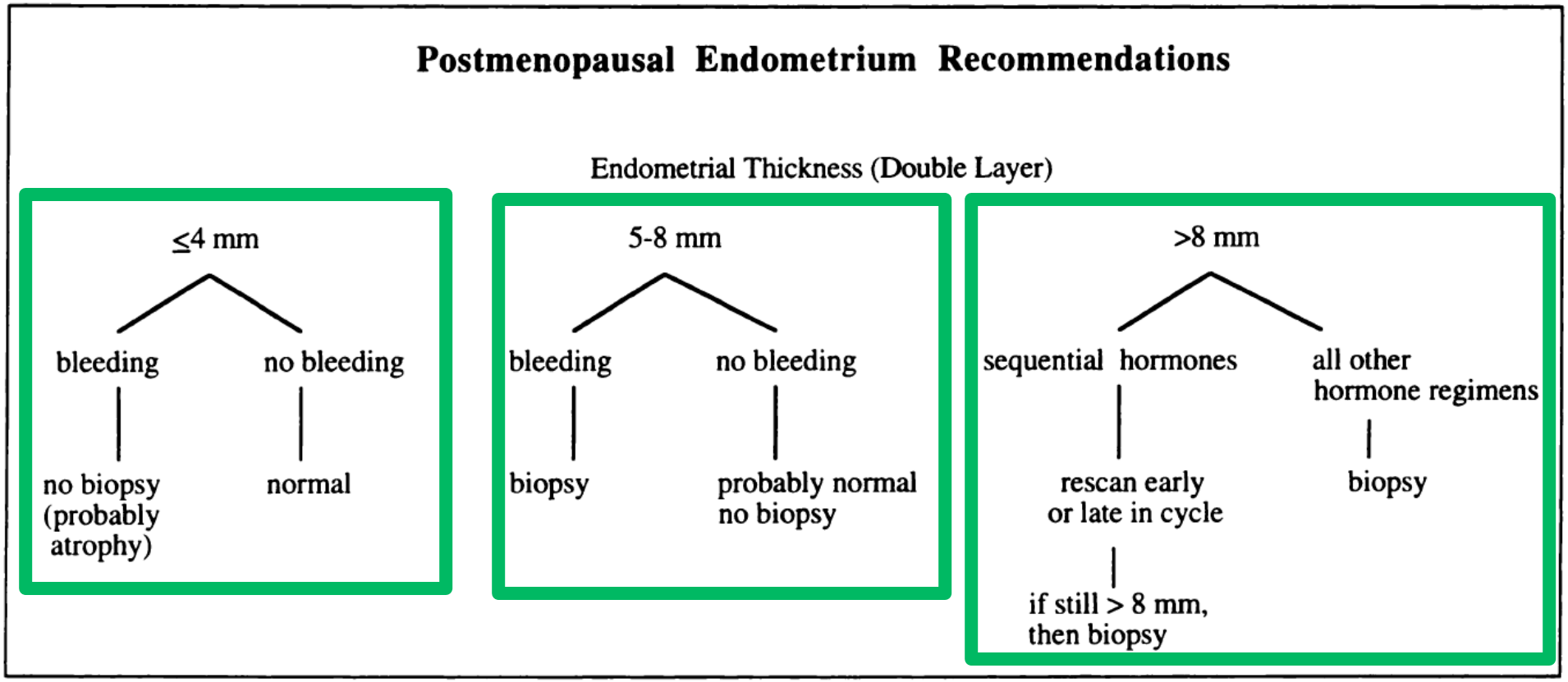


Figure 5. Flow chart of recommendations for follow-up of postmenopausal women with respect to endometrial thickness, the woman's symptoms (bleeding), and hormone use. Bleeding in this chart signifies abnormal bleeding (not the expected withdrawal bleeding of sequential hormone users).

Change in Endometrial Thickness in Postmenopausal Women Undergoing Hormone Replacement Therapy. Radiology 1995;197: 603-608.

Take home points – AUB

- Structural causes that ultrasound can diagnosis include: polyp, fibroid, adenomyosis, malignancy
- SIS is useful: in diagnosis of polyp, mapping fibroids
- Postmenopausal women with endometrial thickening >4mm and bleeding, biopsy should be considered
- Postmenopausal women with endometrial thickening >11mm should be referred to gynecology

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Management of adnexal masses

- Management of Asymptomatic Ovarian and other Adnexal cysts on ultrasound
  - SRU (Society of Radiologists in Ultrasound) Consensus Conference Statement 2009
- Incidental findings on CT and MRI:
  - White Paper of the ACR (American College of Radiology), Incidental Findings Committee 2013

Definition of menopause

- Average age of menopause is 51 to 53yrs in Western countries (range 40 to 60yrs).
- Postmenopause is defined as 1 year or more of amenorrhea from final menstrual period.
- Physiologically the postmenopausal period can be divided into two stages:
  - Early postmenopause (years 1 to 5 since final menstrual period)
  - Late postmenopause (>5 years since final menstrual period)

Management of asymptomatic ovarian and other adnexal cysts on ultrasound

ORIGINAL RESEARCH

Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US

Society of Radiologists in Ultrasound Consensus Conference Statement

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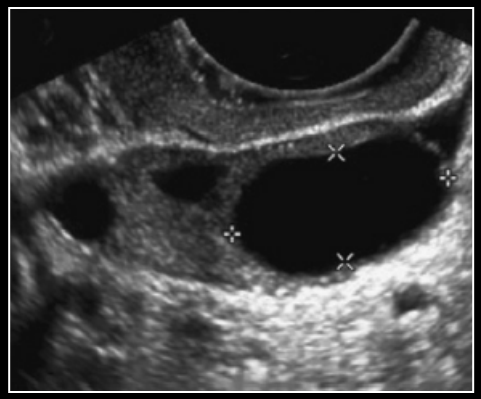
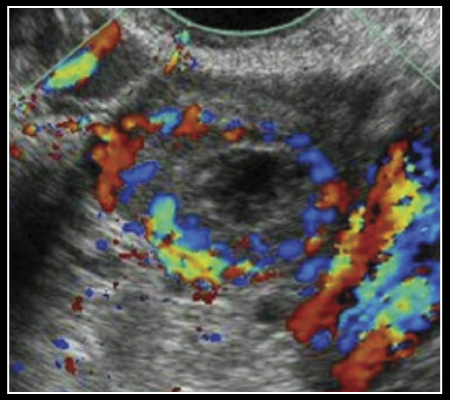
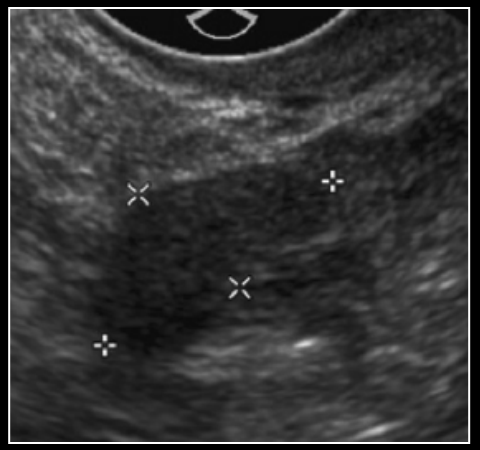
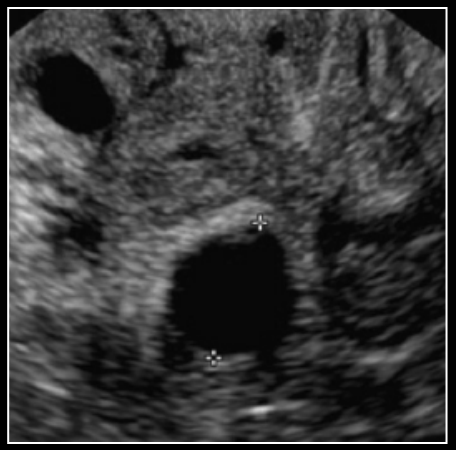
Normal ovary appearance

- Reproductive age follicles
- Reproductive age corpus luteum
- Postmenopausal small ovary
- Postmenopausal simple cyst ≤1 cm

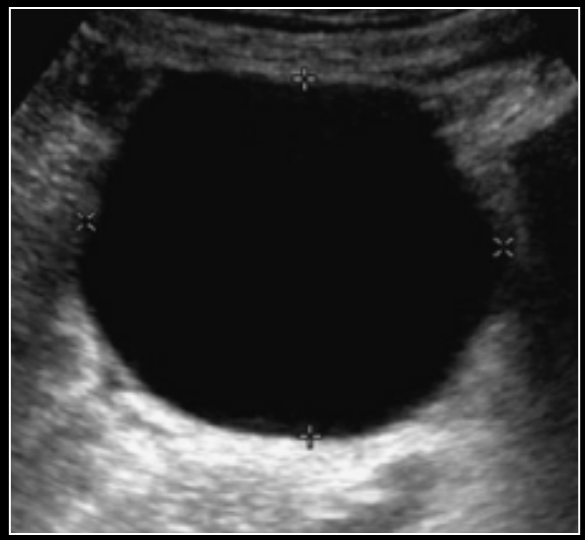





No follow-up needed

Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with benign characteristics

- Simple cysts (includes ovarian and extraovarian cysts)
  - Reproductive age:
  - ≤5 cm: not needed
  - >5 cm & ≤7 cm: yearly
  - Postmenopausal:
  - >1 cm & ≤7 cm: yearly
  - Any age:
  - >7 cm, MRI or surgical evaluation



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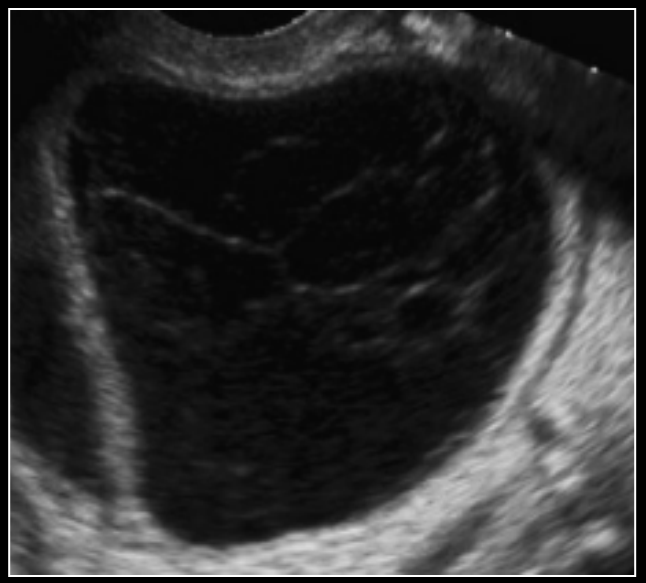
Cysts with benign characteristics

- Hemorrhagic cyst
- Reproductive age:
- ≤5 cm: not needed
- >5 cm: 6 to 12 week f/u to ensure resolution
- Early postmenopause:
- Any size: f/u to ensure resolution
- Late postmenopause:
- Consider surgical evaluation

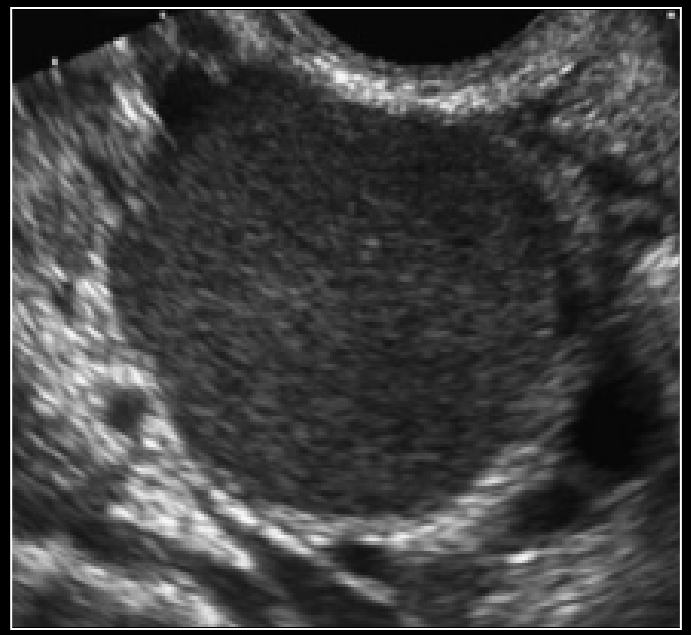


Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with benign characteristics

- Endometrioma

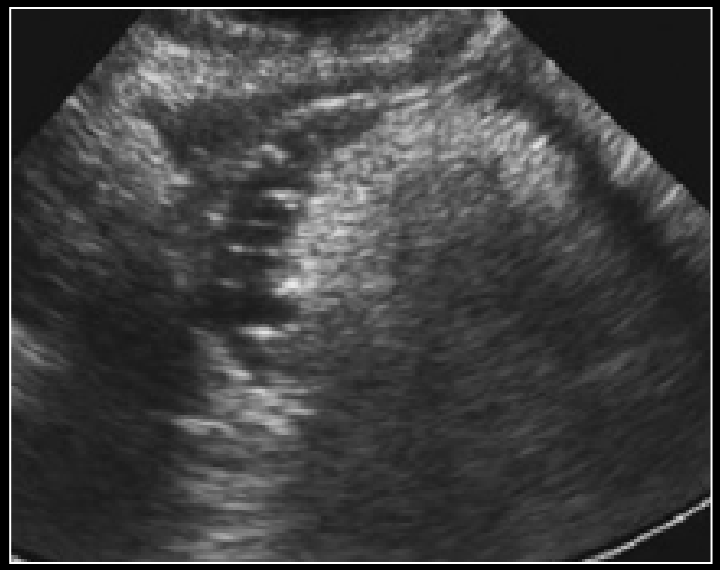
- Any age:
- Initial f/u 6 to 12 weeks, then if not surgically removed, f/u yearly



Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with benign characteristics

- Dermoid



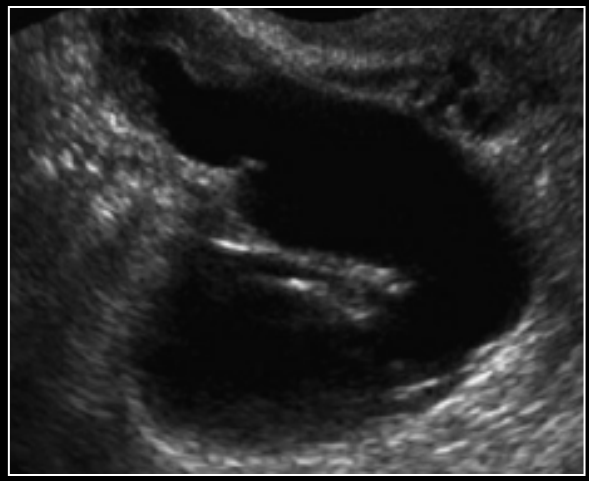
- Any age:
- If not surgically removed, f/u yearly to ensure stability

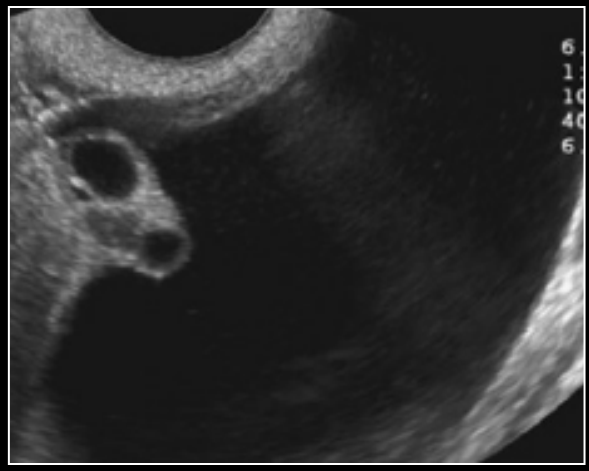
Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with benign characteristics

- Hydrosalpinx
- Peritoneal inclusion cyst

- Any age:
- As clinically indicated



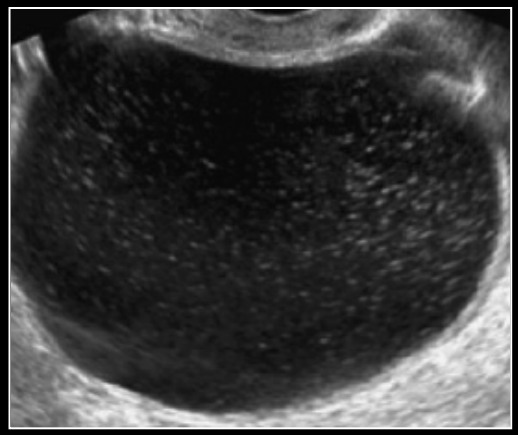


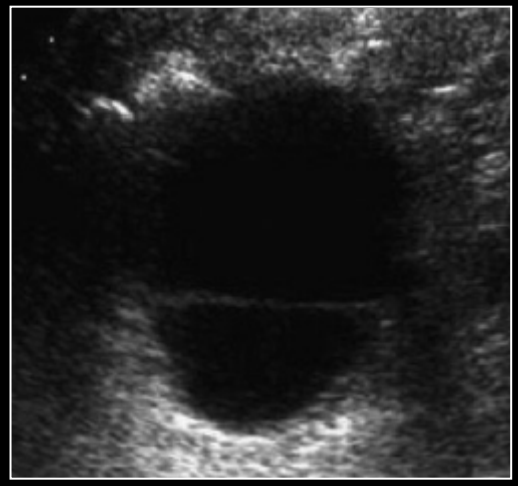
Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with indeterminate, but probably benign characteristics

- Suggestive of, but not classic for hemorrhagic cyst or endometrioma or dermoid
- Thin-walled cyst with single thin septation or focal calcification in the wall of the cyst

- Reproductive age: 6 to 12 week f/u to ensure resolution. If lesion unchanged (hemorrhagic cyst unlikely), continued follow-up with either ultrasound or MRI. If these studies do not confirm endometrioma or dermoid, surgical evaluation considered.
- Postmenopausal: consider surgical evaluation

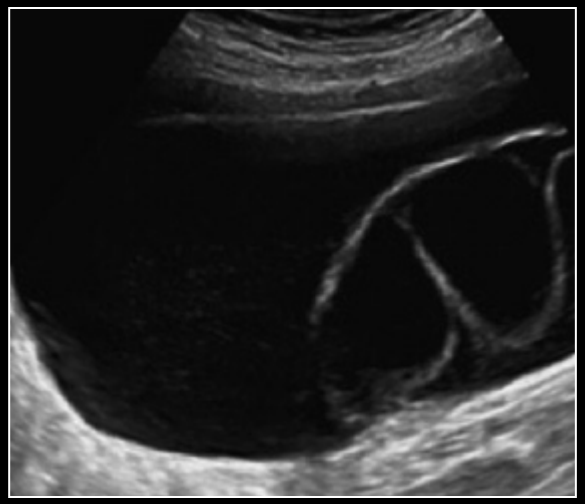




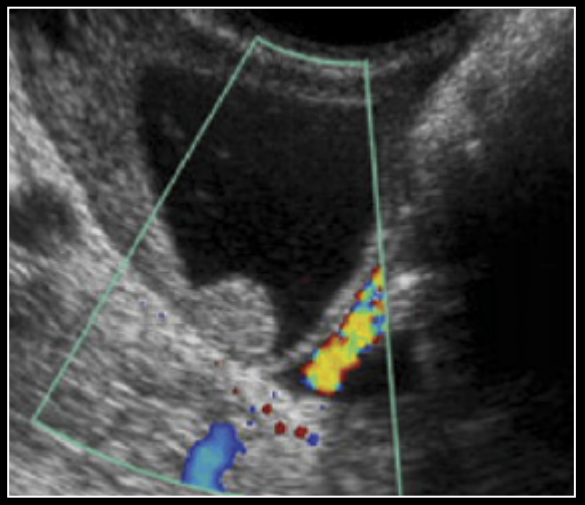
Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with indeterminate, but probably benign characteristics

- Multiple thin septations (<3 mm)



- Nodule (non-hyperechoic) without flow



- Consider surgical evaluation

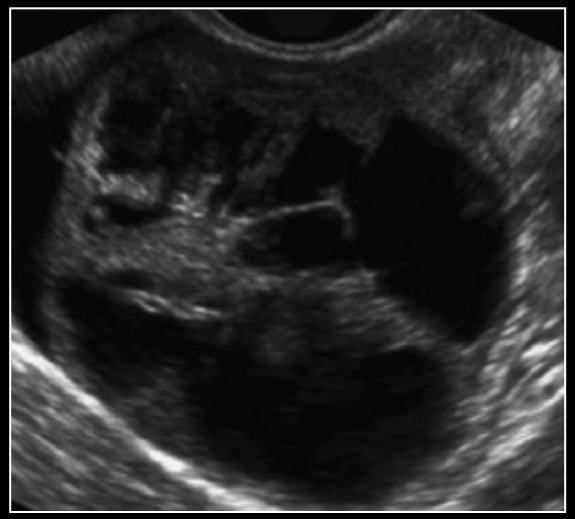
- Surgical evaluation or MRI

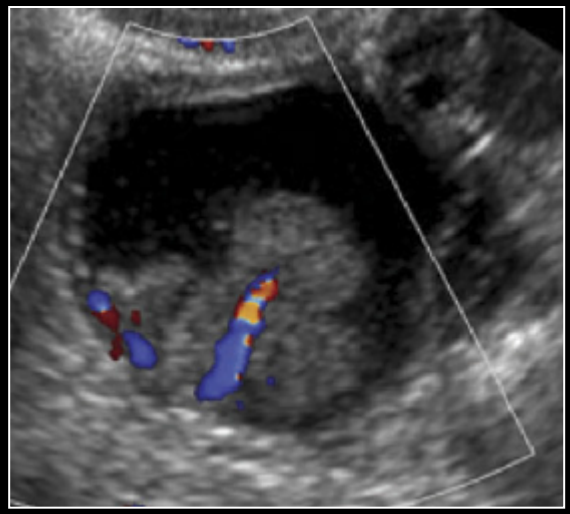
Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Cysts with characteristics worrisome for malignancy

- Thick (>3 mm) irregular septations
- Nodule with blood flow

- Consider surgical evaluation





Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Asymptomatic adnexal cysts

	Simple cyst	Hemorrhagic cyst	Endometrioma	Dermoid
Reproductive age	• Ignore ≤5cm • Follow 5 to 7cm • Surgical evaluation >7cm	• Ignore ≤5cm • Follow to resolution >5cm	• Intial follow-up ultrasound 6 to 12weeks • MRI to confirm if needed • Annual ultrasound if not removed	• MRI to confirm if needed • Annual ultrasound if not removed
Early post-menopause	• Follow 1 to 7cm • Surgical evaluation >7cm	• Follow to resolution any size		
Late post-menopause	• Follow 1 to 7cm • Surgical evaluation 7cm	• Consider surgical evaluation any size		

Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Asymptomatic adnexal cysts

	Multiple thin septations	Nodule with no flow	Thick (>3mm) septations	Nodule with blood flow
Reproductive age	• Consider surgical evaluation • Likely benign neoplasm	• Consider surgical evaluation or MRI • Likely benign neoplasm	• Consider surgical evaluation • Likely neoplasm	• Consider surgical evaluation • Likely neoplasm
Early post-menopause				
Late post-menopause				

Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Take home points – Asymptomatic adnexal cysts

- Postmenopausal simple cysts ≤1 cm are likely benign, are almost always of no clinical importance in asymptomatic women and can be safely ignored
- Simple cysts of any size are unlikely to be malignant lesions, reasonable to f/u with ultrasound when >5 cm in premenopausal women and >1 cm in postmenopausal women
- Classic-appearing hemorrhagic cysts in premenopausal women <5 cm do not require follow-up

Management of asymptomatic ovarian and other adnexal cysts imaged at US. Ultrasound Quarterly 2010; 26: 121-131.

Incidental adnexal findings on CT or MRI

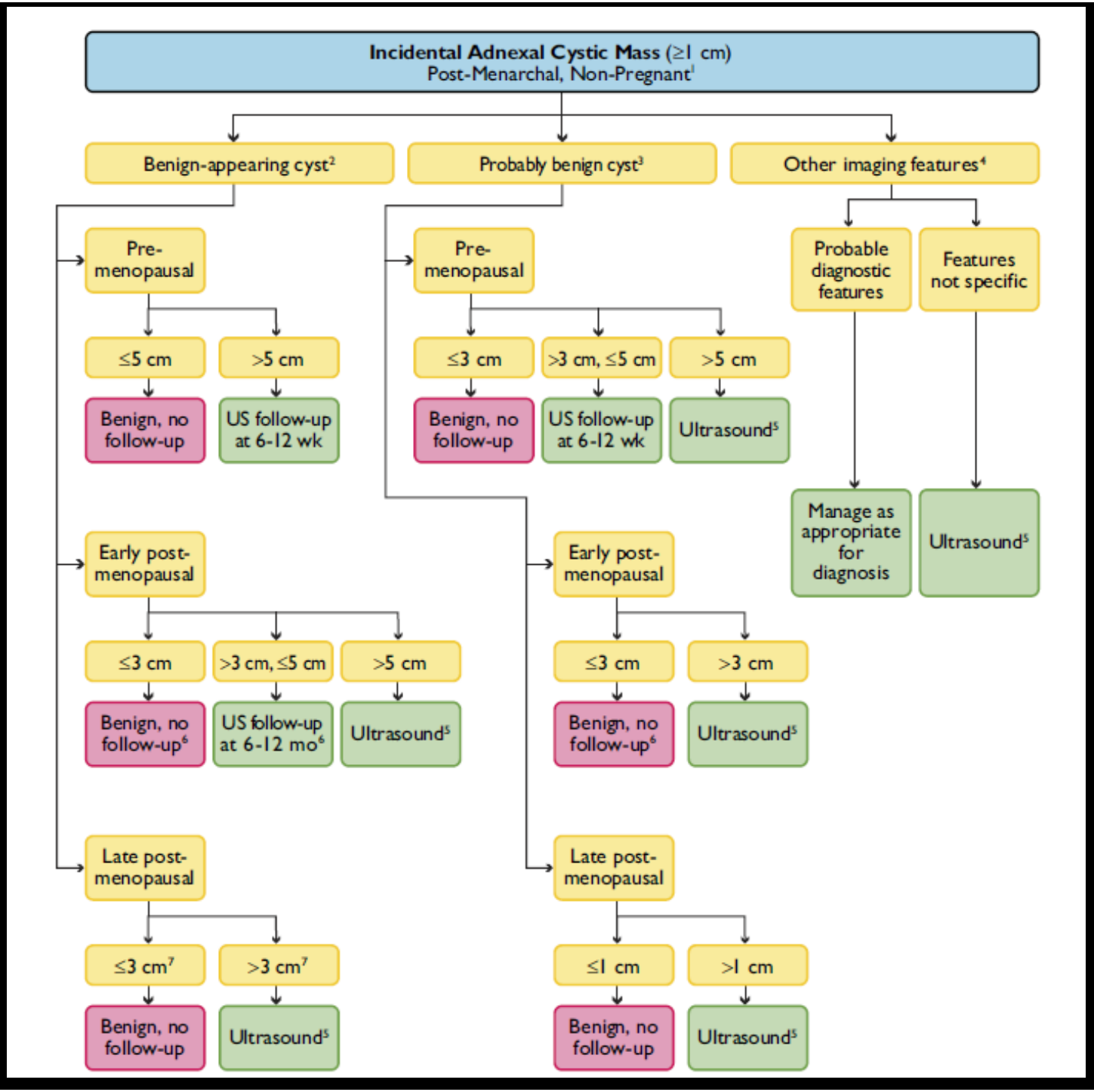
Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings

Maitray D. Patel, MD[a], Susan M. Ascher, MD[b], Raj Mohan Paspulati, MD[c], Alampady K. Shanbhogue, MD[d], Evan S. Siegelman, MD[e], Marjorie W. Stein, MD[f], Lincoln L. Berland, MD[g]

Incidental adnexal findings on CT or MRI

- Management of incidental CT or MRI findings in nonpregnant postmenarchal patients in whom no adnexal disorder is clinically known or suspected.

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.


Incidental Adnexal Cystic Mass (≥1 cm)
Post-Menarchal, Non-Pregnant[1]
Benign-appearing cyst[2]
Probably benign cyst[3]
Other imaging features[4]
Pre-menopausal
≤5 cm
>5 cm
Benign, no follow-up
US follow-up at 6-12 wk
Early post-menopausal
≤3 cm
>3 cm, ≤5 cm
>5 cm
Benign, no follow-up[6]
US follow-up at 6-12 mo[6]
Ultrasound[5]
Late post-menopausal
≤3 cm[7]
>3 cm[7]
Benign, no follow-up
Ultrasound[5]
Pre-menopausal
≤3 cm
>3 cm, ≤5 cm
>5 cm
Benign, no follow-up
US follow-up at 6-12 wk
Ultrasound[5]
Early post-menopausal
≤3 cm
>3 cm
Benign, no follow-up[6]
Ultrasound[5]
Late post-menopausal
≤1 cm
>1 cm
Benign, no follow-up
Ultrasound[5]
Probable diagnostic features
Features not specific
Manage as appropriate for diagnosis
Ultrasound[5]

Not applicable cysts

- Exclusions:
  - A) Normal findings, including hypodense ovary, corpus luteum
  - B) unimportant findings, including calcifications without associated noncalcified mass
  - C) previous characterization with ultrasound or MRI
  - D) documented stability in size and appearance >2 yrs

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.

Benign-appearing cysts

Should have all of the following features:

- Oval or round
- Unilocular, with uniform fluid attentuation or signal (layer hemorrhage acceptable if premenopausal)
- Regular or imperceptible wall
- No solid area, no mural nodule
- <10 cm maximum diameter

- A benign-appearing cyst ≤5cm with suspected internal hemorrhage in a patient aged ≤55 yrs, or within 5 years of menopause, should be followed in 6 to 12 weeks because hemorrhagic cysts in early postmenopause are possible, although rare.
- Cysts greater >5 cm on CT should be first characterized promptly with ultrasound, rather than follow-up.

	Size	Action
Pre-menopausal	• ≤5 cm	• Benign, no follow-up
	• >5cm	• US 6 to 12weeks
Early post-menopause	• ≤3cm	• Benign, no follow-up
	• >3cm, ≤5cm	• US 6 to 12 months
	• >5cm	• Ultrasound (prompt)
Late post-menopause	• ≤3cm	• Benign, no follow-up
	• >3cm	• Ultrasound (prompt)

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.

Probably benign cysts

- **May have:**

a) Angulated margins
b) Not round or oval
c) Portion of the cyst is poorly imaged
d) Reduced SNR on MRI

	Size	Action
Pre-menopausal	• ≤3cm	• Benign, no follow-up
	• >3cm, ≤5cm	• US 6 to 12weeks
	• >5cm	• Ultrasound (prompt)
Early post-menopause	• ≤3cm	• Benign, no follow-up
	• >3cm	• Ultrasound (prompt)
Late post-menopause	• ≤1cm	• Benign, no follow-up
	• >1cm	• Ultrasound (prompt)

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.

Other imaging features

	Examples	Action
Probable diagnostic features *adnexal CT and MR findings diagnosed with a high degree of certainty	• Paraovarian cyst • Hydrosalpinx • Peritoneal inclusion cyst • Cystic teratoma • Endometrioma • Leiomyoma • Ovarian fibroma • Malignancy	• Manage as appropriate for diagnosis
Features not specific	• Solid component • Mural nodule • Septations • Higher than fluid attenuation • Layering hemorrhage post-menopausal	• Ultrasound (prompt)

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.

Take home points – CT or MRI adnexal incidentalomas

Premenopausal woman:

- benign cyst or probably benign cyst ≤3 cm is normal

Early postmenopausal woman:

- Benign-appearing cyst >5 cm, prompt ultrasound
- Probably benign cyst >3 cm, prompt ultrasound

Late postmenopausal woman:

- Prompt ultrasound follow-up in a probably benign cyst >1 cm

Managing Incidental Findings on Abdominal and Pelvic CT and MRI, Part 1: White Paper of the ACR Incidental Findings Committee II on Adnexal Findings. J Am Coll Radiol 2013;10: 675-681.

Summary

- Transabdominal and transvaginal ultrasound are the first line imaging tests for the pelvis
- SIS is useful to characterize an endometrial abnormality seen on TVS (especially endometrial polyp), mapping of fibroids
- CT plays no (little) role in the characterization of pelvic organs **

Summary

- Consider MRI:
- Simple cyst >7cm
- Adnexal cyst that is probably a benign endometrioma, dermoid (or hemorrhagic cyst), AFTER a 6 to 12 week follow-up to see if the lesion has resolved
- Cyst with a nodule with no flow, any age

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