

**American College of Radiology
ACR Appropriateness Criteria®**

Clinical Condition: Clinically Suspected Adnexal Mass

Variant 1: Reproductive age female (not pregnant). Initial evaluation.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
MRI pelvis with or without contrast	5	Used as a second-line problem-solving tool if US is inconclusive or technically limited. See statement regarding contrast in text under "Anticipated Exceptions."	None
CT pelvis with or without contrast	3		Med
Image-guided aspiration or biopsy adnexal mass	2		NS
FDG-PET whole body	1		High
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 2: Reproductive age female (not pregnant) with complex or solid mass detected by pelvic sonography. Follow-up recommendations.

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
MRI pelvis with or without contrast	7	If lesion is very large or if origin (uterine vs ovary) is unclear. See statement regarding contrast in text under "Anticipated Exceptions."	None
CT pelvis with or without contrast	3	May be appropriate if nongynecologic source of malignancy is suspected and CT is done for staging.	Med
FDG-PET whole body	2		High
Image-guided aspiration or biopsy adnexal mass	2		NS
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition:**Clinically Suspected Adnexal Mass****Variant 3:**

Reproductive age female (not pregnant) with complex or solid mass detected by pelvic sonography getting smaller at short-term follow-up. (If resolved, no further imaging necessary.)

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	Either TAS and/or TVS may be tailored as appropriate to visualize the lesion.	None
US pelvis transabdominal	9	Either TAS and/or TVS may be tailored as appropriate to visualize the lesion.	None
US pelvis with Doppler	9	With either TAS or TVS to exclude vascular flow.	None
MRI pelvis with or without contrast	2		None
CT pelvis with or without contrast	1		Med
FDG-PET whole body	1		High
Image-guided aspiration or biopsy adnexal mass	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 4:

Reproductive age female (not pregnant) with complex or solid mass that is persistent or enlarging on pelvic sonography at short-term follow-up.

Radiologic Procedure	Rating	Comments	RRL*
MRI pelvis with or without contrast	8	If conservative (nonsurgical) management is elected and malignancy cannot be excluded. See statement regarding contrast in text under “Anticipated Exceptions.”	None
CT pelvis with or without contrast	7	To stage suspected ovarian cancer or to evaluate for primary malignancy in suspected metastases.	Med
FDG-PET whole body	2	Not appropriate for tissue characterization of adnexal lesions. For ovarian cancer staging, see the ACR Appropriateness Criteria® on “ Staging and Follow-up of Ovarian Cancer .”	High
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition:**Clinically Suspected Adnexal Mass****Variant 5:****Reproductive age female (not pregnant). Initial sonography demonstrates a large and apparently simple cyst >6 cm in diameter.**

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US pelvis transvaginal	9	Either TAS and/or TVS may be tailored as appropriate to visualize the lesion.	None
US pelvis transabdominal	9	Either TAS and/or TVS may be tailored as appropriate to visualize the lesion.	None
US pelvis with Doppler	9	With either TAS or TVS to exclude vascular flow.	None
MRI pelvis with or without contrast	6	If US evaluation is limited due to large size of mass. See statement regarding contrast in text under “Anticipated Exceptions.”	None
CT pelvis with or without contrast	2		Med
Image-guided aspiration or biopsy adnexal mass	2	Not appropriate for diagnosis, unless infectious etiology is suspected. May be used as a therapeutic tool.	NS
FDG-PET whole body	1		High
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 6:**Postmenopausal female (>12 months amenorrhea). Initial evaluation.**

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
MRI pelvis with or without contrast	5	For further evaluation of the mass if ultrasound is inconclusive. See statement regarding contrast in text under “Anticipated Exceptions.”	None
CT pelvis with or without contrast	2		Med
FDG-PET whole body	2		High
Image-guided aspiration or biopsy adnexal mass	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition:**Clinically Suspected Adnexal Mass****Variant 7:**

Postmenopausal female (>12 months amenorrhea) with a simple ovarian cyst >5 cm in diameter by pelvic sonography. Follow-up recommendations. (See narrative for information regarding CA 125.)

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
MRI pelvis with or without contrast	5	For further evaluation of the mass if ultrasound is inconclusive. See statement regarding contrast in text under "Anticipated Exceptions."	None
CT pelvis with or without contrast	3	For staging of suspected malignancy.	Med
FDG-PET whole body	2		High
Image-guided aspiration or biopsy adnexal mass	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 8:

Postmenopausal female (>12 months amenorrhea) with a simple ovarian cyst 3-5 cm in diameter seen by pelvic sonography. Follow-up recommendations. (See narrative for information regarding CA 125.) (Simple cyst <3 cm, usually managed by serial sonographic studies in an average-risk woman with normal CA 125.)

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
MRI pelvis with or without contrast	4	If US technically limited. See statement regarding contrast in text under "Anticipated Exceptions."	None
CT pelvis with or without contrast	2		Med
FDG-PET whole body	1		High
Image-guided aspiration or biopsy adnexal mass	1		NS
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition:**Clinically Suspected Adnexal Mass****Variant 9:**

Postmenopausal female (>12 months amenorrhea) with a complex or solid adnexal mass seen by pelvic sonography. Follow-up recommendations. (See narrative for information regarding CA 125.)

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US pelvis transvaginal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis transabdominal	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
US pelvis with Doppler	9	All three tests (TVS, TAS, and Doppler) may be performed depending on the clinical circumstances.	None
CT pelvis with or without contrast	7	To stage ovarian cancer or to identify primary intra-abdominal carcinoma.	Med
MRI pelvis with or without contrast	7	For further evaluation of the mass if ultrasound is inconclusive. See statement regarding contrast in text under "Anticipated Exceptions."	None
FDG-PET whole body	3	May be useful in patients with known primary malignancy outside the ovary.	High
Image-guided aspiration or biopsy adnexal mass	1		NS
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

CLINICALLY SUSPECTED ADNEXAL MASS

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Summary of Literature Review

Adnexal masses have a long list of diagnostic possibilities, and pelvic sonography (US) should be correlated with history and laboratory tests. Morphological analysis of adnexal masses with US can help narrow the differential diagnosis; however, US cannot always distinguish malignant from benign masses with the accuracy sufficient to avert surgery [1,2]. Transabdominal sonography (TAS) and transvaginal sonography (TVS) US complement each other, and in many facilities, patients are scanned by both techniques [3].

Transvaginal Ultrasound

The applications of TVS in evaluating adnexal masses have been well described [3,4]. Because of the improved resolution of TVS, it should be used whenever possible. When an adnexal mass is large or beyond the field of view of TVS, TAS is recommended. TAS will often provide an overview of the relationship of the mass to other pelvic structures.

The improved resolution of high-frequency transducers within the vagina increases the diagnostic confidence level in evaluating adnexal masses to about 72%-78% [3]. TVS can be used not only to differentiate between cystic and solid masses but also to improve characterization of the wall thickness, internal septations, mural nodules, and the echogenicity of cystic and complex ovarian masses. TVS has increased the specificity for diagnosing ovarian cancer to as high as 83% [3].

In addition, TVS or TAS with color, power, and spectral Doppler can be used to assess the vascularity of a mass and provide a guide for aspiration of certain masses.

TVS also can help determine the origin of an adnexal mass. When evaluating a pelvic mass, it is important to determine its origin — whether it is ovarian or extraovarian. Masses arising from the ovary can be separated from extraovarian masses by identifying a rim of compressed ovarian parenchyma around the mass. Masses arising from the fallopian tube are usually seen as distended fusiform tubular structures which can sometimes be shown to arise from the lateral aspect of the uterus in the region of the cornua. Masses arising from the uterus are usually solid and can often be shown to be connected to the uterus by a vascular pedicle. Using TVS, attachment of a mass to the ovary or to the uterus can often be determined, using the sliding organ sign (Timor-Tritsch).

TVS can help in characterizing a mass sonographically as cystic, solid, or complex. Cystic masses are usually ovarian or tubal. A simple cystic mass is an anechoic mass with smooth, thin walls and no mural nodules or septations, and is associated with acoustic enhancement.

Simple Cyst

Characterization of an adnexal mass as a cyst is important for management. US identification of a simple cystic mass establishes a benign process in 100% of premenopausal women and in 95% of postmenopausal women [5]. There are no firm data to support recommendations for specific follow-up intervals. Most cysts in premenopausal women are functional in nature and will resolve spontaneously. Most nonfunctional cysts in premenopausal women with benign US features (such as endometriomas, simple cysts, dermoid cysts, and hydrosalpinges) measuring <6 cm in diameter have been shown to remain unchanged during long-term follow-up. Therefore, it is possible to manage these lesions safely by US follow-up rather than surgical intervention in asymptomatic women [6].

In postmenopausal women, simple cysts are seen with a frequency of about 17% and are not related to hormonal therapy or time since onset of menopause, although some have observed decreasing frequency with time since onset of menopause. These cysts may disappear (53%), not change (28%), enlarge (11%), decrease (3%), or increase and decrease (6%) [7]. Although adnexal cysts ≤5 cm in postmenopausal women are rarely malignant, a 3-5 cm cyst may require further evaluation by means of CA 125, Doppler findings, and US follow-up [8]. TVS aspiration of adnexal cysts should be performed only when there is strong evidence of a benign etiology in order to avoid potential complications such as peritoneal contamination by ovarian cancer cells or pseudomyxoma peritonei [9]. TVS aspiration plays an important role in the diagnosis and treatment of tubovarian abscesses (TOAs) [10]. It may also be performed for symptomatic relief in cases of

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large peritoneal inclusion cysts or benign ovarian cysts [11,12].

Solid or Complex Masses

Most solid adnexal masses are pedunculated leiomyomas (myomas, fibroids). Leiomyomas are the most common uterine neoplasms, and are found in 20%-30% of women older than age 30. Pedunculated fibroids sometimes can be mistaken for solid ovarian masses. Careful search and identification of normal ovaries that may be displaced by uterine myomas helps avoid this error.

Solid ovarian masses include benign ovarian tumors such as some cystic teratomas, fibromas, thecomas, malignant ovarian tumors (primary and metastatic), and ovarian torsion. The most common ovarian neoplasm in women of reproductive age is benign cystic teratoma, which has a broad spectrum of US appearances. When the diagnosis is in doubt, computed tomography (CT) or magnetic resonance imaging (MRI) can depict the fatty elements, teeth (7%), or bony fragments (18%) characteristic of these lesions. Most solid ovarian masses are removed surgically. Even benign solid masses, if large, present a risk of torsion and a small long-term risk of malignant degeneration.

Complex adnexal masses are usually ovarian in origin. In women of reproductive age these most commonly present as hemorrhagic cysts or endometriomas. The US characteristics suggest the diagnosis, and a follow-up US can be done after one or two menstrual cycles to evaluate for resolution. The optimal time for this follow-up evaluation is within the first 7-10 days of the onset of the menses in order to avoid confusion with a new hemorrhagic cyst. Typically hemorrhagic cysts will resolve, while endometriomas will persist. When atypical features are present, MRI can be useful to confirm the presence of endometriosis. In the appropriate clinical setting, TOAs, ectopic pregnancies, and adnexal torsion can present as complex masses; therefore, a pregnancy test is important to narrow the differential diagnosis.

Even though US may occasionally not be able to definitely distinguish malignant from benign neoplasms, it provides useful information. Various authors have devised morphologic scoring systems for pelvic masses to predict ovarian malignancy based on size, internal borders, and the presence of septa, papillary projections, and echogenicity [13,14]. The presence of mural nodules or septations suggests that an adnexal mass is a neoplasm. Three-dimensional US morphologic assessment does not appear to improve the diagnosis of complex adnexal masses [15]; however, the combination of three-dimensional US and three-dimensional color and duplex Doppler may contribute to the differentiation between benign and malignant masses because it improves detection of central blood vessels, which are more common in malignant lesions [16].

Color and Duplex Doppler

Color and duplex Doppler have been proposed to help distinguish between malignant and benign adnexal masses

[17]. Early work showed that the overall accuracy of characterization of benign and malignant masses was 94% for morphologic appearance and 80% with color and duplex Doppler imaging, with no significant difference in sensitivity [18]. Hata et al [19] compared TVS Doppler with TVS morphologic findings. However, using a resistive index (RI) cutoff of 0.72 gave a sensitivity of 92.6% and specificity of 52.6%, similar to results obtained with TVS alone. More recent studies have established that pulsed spectral Doppler US parameters (RI, pulsatility index [PI], PSV, time-averaged Vmax) do not provide any significant improvement over morphologic assessment; therefore, the value of pulsed spectral Doppler analysis is limited [20,21]

Malignant masses are usually vascular. The low-resistant Doppler waveform with PI <1 or RI <0.4 seen in malignant lesions can also be demonstrated in inflammatory masses, vascular benign neoplasms, endometriomas, corpus luteal cysts, and ectopic pregnancies [22]. High PI or RI suggests benignity; however, malignant tumors may show relatively high impedance flow also. The overlap of these indices in benign and malignant masses limits their clinical usefulness [23]. Optimal evaluation of adnexal masses for possible malignancy is achieved by a combination of gray-scale morphologic assessment and color or power Doppler imaging to detect flow within any solid areas [20,21,24].

The combination of color Doppler with serum CA 125 has been proposed to increase sensitivity for differentiating benign from malignant ovarian tumors [25]. When increasing the cutoff point of CA 125 from 35 U/ml to 65 U/ml in the presence of RI <0.5, the best specificity (100%) and positive predictive value (PPV) (100%) were reached [26,27]. The combination of US criteria and multiple serum tumor markers assay (CA 125, CA19.9, CA15.3, AFP, CEA, and estradiol) increases the sensitivity for benign and malignant neoplasm compared to US criteria alone (sensitivity of RI [<0.4] was 17% and 63.6% for benign and malignant neoplasia, respectively compared with 53.1% and 90.9% for RI and tumor markers) [28].

The goal of the US examination is not simply evaluation of the adnexal mass but also the ability to combine the ancillary features such as hydronephrosis, ascites, pleural effusions, and liver, peritoneal, or omental metastases which will help in the diagnosis and overall assessment.

Magnetic Resonance Imaging

MRI can be used to determine the origin of a mass (uterine versus ovarian) and help distinguish benign from malignant masses with an overall accuracy for the diagnosis of malignancy of 91%. On MRI, identification of vegetations in cystic masses and ascites is the best indicator of malignancy. A meta-analysis comparing the incremental value of a second test to evaluate an indeterminate adnexal mass on gray-scale US determined that contrast-enhanced MRI contributed to a greater change in the probability of ovarian cancer than CT,

Doppler US, or MRI without contrast [31]. In addition, MRI increases confidence in the diagnosis of mature cystic teratoma and leiomyoma [29]. MRI is valuable for characterizing indeterminate adnexal masses seen on US, with a sensitivity for identifying malignancy of 100% and a specificity for benignity of 94% [30]. In a prospective study of women with suspected adnexal masses, both US with Doppler and MRI were highly sensitive for characterizing lesions as malignant (US 100%, MRI 96.6%), but the specificity of MRI was significantly greater (US 39.5%, MRI 83.7%). Therefore, women who clinically have a low risk of malignancy but have complex lesions on US are the patients who will most likely benefit from contrast-enhanced MRI [31].

Computed Tomography

CT is usually not indicated for the differential diagnosis of adnexal masses because of poor soft-tissue discrimination, except when identification of characteristic calcifications (such as teeth in a dermoid) or macroscopic fat is important to make the diagnosis [32]. If the adnexal mass is thought to be malignant, CT may be indicated to stage a suspected primary ovarian cancer (see the ACR Appropriateness Criteria® on “[Staging and Follow-up of Ovarian Cancer](#)”) or to identify the primary intra-abdominal cancer (eg, colon, gastric, pancreatic) with suspected ovarian metastases. In addition, CT involves radiation exposure, which is a disadvantage compared to US and MRI.

Positron Emission Tomography

The sensitivity and specificity of positron emission tomography (PET) in evaluating suspected adnexal masses in asymptomatic females are only 58% and 76%, respectively. However, PET may play a role in women with known history of malignancy who present for evaluation of an adnexal mass to identify other sites of disease [33].

Summary

- US remains the primary modality for evaluating a woman with a clinically suspected adnexal mass.
- US remains the most important modality for follow-up of adnexal masses.
- MRI is a valuable problem-solving tool when US is inconclusive or limited due to body habitus.
- To a lesser extent, CT is useful in selected cases when a nongynecologic origin of an adnexal mass is suspected. It should not be used in most cases as the primary imaging tool, despite its expediency, primarily because of its nonspecificity and relatively high radiation dose.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has

occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (ie, <30 mL/min/1.73m²), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73m². For more information, please see the [ACR Manual on Contrast Media](#) [34].

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

Relative Radiation Level Designations	
Relative Radiation Level*	Effective Dose Estimate Range
None	0
Minimal	< 0.1 mSv
Low	0.1-1 mSv
Medium	1-10 mSv
High	10-100 mSv

*The RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, the region of the body exposed to ionizing radiation, the imaging guidance that is used, etc). The RRLs for these examinations are designated as NS (not specified).

Supporting Document(s)

- [ACR Appropriateness Criteria® Overview](#)
- [Evidence Table](#)

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.