American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Suspected Adnexal Mass**

Variant 1: **Premenopausal female.**

Radiologic Procedure	Rating	Comments	RRL*
Pregnancy test	9	Pregnancy status is helpful before performing any imaging study.	None
US pelvis transvaginal	8		None
US pelvis transabdominal	8		None
US pelvis with Doppler	6		None
MRI pelvis	4		None
CT pelvis	4		Med
X-ray abdomen and pelvis	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 2: **Postmenopausal female.**

Radiologic Procedure	Rating	Comments	RRL*
CA-125	9		None
US pelvis transvaginal	8		None
US pelvis transabdominal	8		None
US pelvis with Doppler	6		None
CT pelvis	4		Med
MRI pelvis	4		None
X-ray abdomen and pelvis	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 3: **Premenopausal female with complex or solid mass evaluated by TAS, TVS, or both; positive pregnancy test.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 6 weeks	5	Ectopic pregnancy must be excluded initially.	None
US pelvis with Doppler	4		None
US pelvis follow up 12 weeks	2		None
X-ray contrast enema	2		Med
X-ray abdomen and pelvis	2		Med
X-ray intravenous urography	2		Med
US pelvis follow up 6 months	2		None
MRI pelvis	2		None
INV image-guided aspiration adnexal mass	2		IP
CT pelvis	2		Med
FDG-PET pelvis	1		High
CA-125	1		None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 4: **Premenopausal female with complex or solid mass evaluated by TAS, TVS, or both; negative pregnancy test.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 6 weeks	8		None
US pelvis with Doppler	6		None
US pelvis follow up 12 weeks	6		None
CA-125	4	Should be aware that there can be many false positives.	None
X-ray intravenous urography	4		Med
MRI pelvis	4		None
CT pelvis	4		Med
FDG-PET pelvis	2		High
INV image-guided aspiration adnexal mass	2		IP
X-ray abdomen and pelvis	2		Med
US pelvis follow up 6 months	2		None
X-ray contrast enema	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 5: **Premenopausal female with complex mass evaluated by TVS: not changed in 6 weeks.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 6 weeks	6	After 6-week interval with no changes, follow-up with surgical exploration.	None
US pelvis with Doppler	6		None
CA-125	4	Follow-up in another 6 weeks would be adequate.	None
INV image-guided aspiration adnexal mass	4		IP
CT pelvis	4	Not indicated unless dermoid suspected.	Med
MRI pelvis	4		None
FDG-PET pelvis	2		High
US pelvis follow up 12 months	2		None
X-ray contrast enema	2		Med
US pelvis follow up 12 weeks	2		None
US pelvis follow up 6 months	2		None
X-ray abdomen and pelvis	2	Not indicated unless dermoid suspected.	Med
X-ray intravenous urography	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 6: **Postmenopausal female with a simple ovarian cyst >5 cm in diameter by TAS, TVS, or both.**

Radiologic Procedure	Rating	Comments	RRL*
CA-125	6		None
US pelvis with Doppler	6		None
INV image-guided aspiration adnexal mass	4		IP
US pelvis follow up 6 months	2		None
FDG-PET pelvis	2		High
CT pelvis	2		Med
X-ray abdomen and pelvis	2		Med
X-ray contrast enema	2		Med
MRI pelvis	2		None
US pelvis follow up 12 weeks	2		None
US pelvis follow up 6 weeks	2		None
X-ray intravenous urography	2		Med
US pelvis follow up 12 months	2		None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 7: **Postmenopausal female with a simple ovarian cyst 3-5 cm in diameter by TAS, TVS, or both.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 6 months	7	No solid data to support interval of follow-up.	None
US pelvis follow up 12 months	7	No solid data to support interval of follow-up.	None
CA-125	6		None
US pelvis follow up 12 weeks	5	No solid data to support interval of follow-up.	None
INV image-guided aspiration adnexal mass	4		IP
US pelvis with Doppler	4		None
FDG-PET pelvis	2		High
MRI pelvis	2		None
CT pelvis	2		Med
US pelvis follow up 6 weeks	2	No solid data to support interval of follow-up.	None
X-ray intravenous urography	2		Med
X-ray abdomen and pelvis	2		Med
X-ray contrast enema	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 8: **Postmenopausal female with a simple ovarian cyst <3 cm in diameter by TAS, TVS, or both.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 12 months	7		None
CA-125	5		None
US pelvis follow up 6 months	4		None
US pelvis follow up 12 weeks	4		None
US pelvis with Doppler	3	Initial Doppler evaluation could be used for baseline vascularity. If change is detected, it may influence management.	None
FDG-PET pelvis	2		High
CT pelvis	2		Med
MRI pelvis	2		None
US pelvis follow up 6 weeks	2		None
INV image-guided aspiration adnexal mass	2		IP
X-ray intravenous urography	2		Med
X-ray abdomen and pelvis	2		Med
X-ray contrast enema	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Clinical Condition: **Suspected Adnexal Mass**

Variant 9: **Postmenopausal female with simple ovarian cyst <5cm and RI <0.4 or PI <1.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis follow up 12 months	8		None
CA-125	7		None
US pelvis follow up 6 months	6		None
FDG-PET pelvis	2		High
MRI pelvis	2		None
X-ray intravenous urography	2		Med
INV image-guided aspiration adnexal mass	2		IP
US pelvis follow up 12 weeks	2		None
X-ray abdomen and pelvis	2		Med
CT pelvis	2		Med
US pelvis follow up 6 weeks	2		None
X-ray contrast enema	2		Med
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Variant 10: **Postmenopausal female with a complex or solid adnexal mass by TAS, TVS, or both.**

Radiologic Procedure	Rating	Comments	RRL*
US pelvis with Doppler	8		None
CA-125	7		None
MRI pelvis	4	Either CT or MRI helpful for staging.	None
CT pelvis	3	Either CT or MRI helpful for staging.	Med
FDG-PET pelvis	2		High
US pelvis follow up 6 months	2		None
X-ray intravenous urography	2		Med
INV image-guided aspiration adnexal mass	2		IP
US pelvis follow up 12 weeks	2		None
US pelvis follow up 6 weeks	2		None
X-ray contrast enema	2		Med
X-ray abdomen and pelvis	2		Med
US pelvis follow up 12 months	2		None
Rating Scale: 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

Expert Panel on Women's Imaging: Marcela Böhm-Vélez, MD[1]; Arthur C. Fleischer, MD[2]; Rochelle F. Andreotti, MD[3]; Elliot K. Fishman, MD[4]; Mindy M. Horrow, MD[5]; Hedvig Hricak, MD, PhD[6]; Amy Thurmond, MD[7]; Carolyn Zelop, MD.[8]

Summary of Literature Review

Adnexal masses have a long list of diagnostic possibilities, and ultrasound (US) study 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 (TAS) and transvaginal (TVS) ultrasound complement each other, and in many facilities, patients are scanned by both techniques [3].

The applications of TVS in evaluating adnexal masses have been well described [3,4]. TVS is useful where TA studies are suboptimal in studying obese patients, or for women who have a large amount of intestinal gas or are unable to adequately distend their bladders. 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 septations, mural nodules, and echogenicity of cystic and complex ovarian masses by giving additional information on the wall thickness and inner wall. TVS has increased the specificity to 83% for diagnosing ovarian cancer [3].

In addition, TVS can be used to assess the vascularity of a mass and provide a guide for aspiration of certain masses. However, due to the narrow field of view of the TV probe, TAS is needed to provide an overview of the relationship of the mass to other pelvic structures.

TVS also can help determine the origin of the mass. When evaluating pelvic masses, 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, which can form a break sign. Masses arising from the fallopian tube are usually seen as distended fusiform tubular structures in the lateral aspect of the uterine cornua. Masses arising from the uterus are usually solid, and there is no cleavage plane between the mass and the uterus.

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, no mural nodules or septations, and associated with acoustic enhancement.

Identification of a cyst has extremely important implications for subsequent management. Sonographic 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 solid data to support recommendations for specific follow-up intervals. Cysts in premenopausal females will resolve spontaneously and need not be removed unless torsion or rupture occurs. In postmenopausal women, cysts are seen with a frequency of 17% and are not related to hormonal therapy or time since onset of menopause. Theses cysts may disappear (53%), not change (28%), enlarge (11%), decrease (3%), or increase and decrease (6%) [6]. Although adnexal cysts 5 cm or less in postmenopausal females are not considered malignant, a 3-5 cm cyst may need to be correlated with CA 125 and Doppler findings [7]. TVS aspiration of simple cysts, done by some, is controversial since either peritoneal contamination by ovarian cancer cells or pseudomyxoma peritonei may result [8]. TVS aspiration plays an important role in diagnosis and treatment of tubovarian abscesses (TOAs) and diagnosis of recurrent ovarian cancer.

Most solid adnexal masses are pedunculated fibroids. Leiomyomas are the most common uterine neoplasms, and 20%-30% occur in women older than 30 years of age. Pedunculated or subserosal fibroids sometimes can be very difficult to differentiate from solid extraovarian masses.

Solid intraovarian masses include benign ovarian tumors such as cystic teratomas, fibromas, thecomas, malignant ovarian tumors, and ovarian torsion. The most common ovarian neoplasm is benign cystic teratima, which has a broad spectrum of sonographic appearances. When the diagnosis is in doubt, computed tomography (CT) can depict the fat, teeth (7%) or bony fragments (18%). All solid intraovarian masses should be removed surgically.

Complex adnexal masses are usually ovarian in origin, and in premenopausal females, most commonly represent hemorrhage cysts or endometriomas. The sonographic characteristics suggest the diagnosis, and a follow-up US can be done in six weeks to evaluate for resolution. In the appropriate clinical setting, TOAs, ectopic pregnancies, and ovarian torsions can present as complex masses;

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therefore, a pregnancy test is important to narrow the differential diagnosis.

Even though US cannot 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 presence of septa, papillary projections, and echogenicity [9,10]. The presence of mural nodules or septations suggests that an adnexal mass is a neoplasm. Three-dimensional sonographic morphologic assessment does not appear to improve the diagnosis of complex adnexal masses [11].

Color flow and Doppler have been proposed to help distinguish between malignant and benign adnexal masses [12]. 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 [13]. Hata et al [14] compared TVS Doppler with TVS 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. Malignant masses are usually vascular. The low resistant Doppler waveform with pulsatility index (PI) <1 or resistive index (RI) <0.4 seen in malignant lesions can also be demonstrated in inflammatory masses, vascular benign neoplasms, endometriomas, corpus luteal cysts, and ectopic pregnancies [15]. A positive value of 73% for diagnosing malignant masses with TV color Doppler imaging will result in one out of four masses that are called malignant by US to be benign histologically [15]. 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 [16].

The combination of color Doppler with serum CA 125 has been proposed to increase sensitivity for differentiating benign from malignant ovarian tumors [17]. When increasing the cutoff point of CA 125 from 35 U/ml to 65 U/ml in the presence of RI <5, the best specificity (100%) and positive predictive value (PPV) (100%) were reached [18,19].

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

In problematic cases, magnetic resonance imaging (MRI) may help to determine the origin of a mass (uterine versus ovarian) and help distinguish benign from malignant with an overall accuracy of 91%. On MRI, identification of vegetations in cystic masses and ascites are the best indicators of malignancy. In addition, MRI increases the confident diagnosis of mature cystic teratoma, and leiomyoma [20].

CT is not indicated for the differential diagnosis of adnexal masses because of poor soft tissue discrimination, except when identification of fat and calcifications is important to make the diagnosis [21]. In addition, CT involves radiation exposure, which is a disadvantage compared to US and MRI.

The sensitivity and specificity of positron emission tomography (PET) in evaluating suspected adnexal masses in asymptomatic females are 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 [22].

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
*RRL assignments are not included for some examinations. The RRL assignments for the IP (in progress) exams will be available in future releases.	

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