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Review Article

Premenopausal ovarian cysts: a practical evidence-based approach to risk assessment, tumor markers, surveillance and surgical management

Hussam Mohamedalhalabi*

Department of Obstetrics and Gynecology, Rheinland Klinikum, Neuss, Germany

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*Correspondence:

Dr. Hussam Mohamedalhalabi,
E-mail: sam_halabi@hotmail.de

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ABSTRACT

Ovarian cysts are common in premenopausal women, and most are physiological or benign. Assessment aims to identify lesions that require further investigation or treatment while avoiding unnecessary surgery and loss of ovarian tissue. This narrative review examines ultrasound characterization, malignancy risk assessment, tumor markers, surveillance, surgical management, and fertility considerations. Transvaginal ultrasonography (TVUS) is the first-line investigation, and lesion morphology should be interpreted alongside symptoms, age, and clinical history. The International Ovarian Tumor Analysis Simple Rules and ADNEX model, together with the Ovarian-Adnexal Reporting and Data System, provide structured approaches to risk assessment. Tumor-marker testing should follow the differential diagnosis. CA125 has limited specificity in premenopausal women, whereas suspected germ-cell or sex-cord stromal tumors may require other markers. Many confidently characterized simple cysts can be managed without intervention. Follow-up depends on lesion type, size, symptoms, and the imaging framework used; persistence alone does not establish malignancy. Indeterminate masses may require expert ultrasound or magnetic resonance imaging, and suspicious lesions warrant gynecological oncology assessment. Acute presentations require urgent evaluation outside elective surveillance pathways. When surgery is appropriate for benign disease, the approach should minimize morbidity and preserve ovarian tissue where feasible. Management therefore requires integration of imaging findings, clinical risk, reproductive priorities, and patient preferences.

Keywords: Adnexal mass, Ovarian cyst, Premenopausal women, IOTA, O-RADS, CA125

INTRODUCTION

Adnexal masses are identified during investigation of pelvic symptoms or incidentally on imaging. In premenopausal women, most are benign, and functional cysts often resolve without treatment. The initial assessment must distinguish these lesions from masses that require additional investigation or specialist referral.¹

This distinction matters because unnecessary intervention can cause operative morbidity and reduce ovarian tissue, whereas inadequate assessment of a suspicious mass can delay appropriate treatment. The clinical decision is therefore whether a lesion requires reassurance,

surveillance, further characterization, surgery, or gynecological oncology review.²

TVUS provides the principal assessment of lesion morphology. Standardized terminology developed by the International Ovarian Tumor Analysis (IOTA) group supports reproducible description of adnexal masses.³ The IOTA Simple Rules and Assessment of Different NEoplasias in the adNeXa (ADNEX) model estimate malignant potential, while the Ovarian-Adnexal Reporting and Data System (O-RADS) links imaging categories to management recommendations.⁴⁻⁷

Biochemical tests supplement clinical and imaging assessment. Their value depends on the suspected

diagnosis, and an isolated abnormal result should not determine treatment.²

This narrative review discusses the assessment and management of ovarian cysts in premenopausal women, with emphasis on morphology, selective tumor-marker testing, surveillance, ovarian preservation, and appropriate referral. It synthesizes published guidance and clinical studies rather than reporting an original patient cohort or a systematic meta-analysis. Elective recommendations principally concern nonpregnant women; acute complications and adolescents require additional considerations.

CLASSIFICATION OF OVARIAN CYSTS AND ADNEXAL MASSES

Ovarian lesions include functional cysts, benign neoplasms, endometriomas, borderline tumors, and invasive malignancies. Establishing the site of origin is important because an apparent ovarian lesion may arise from the fallopian tube or adjacent structures. Table 1 summarizes common lesions and their typical sonographic features.⁸

Functional ovarian cysts

Functional cysts arise during the ovarian cycle. Follicular cysts result from persistence of a follicle, whereas corpus luteum cysts develop after ovulation and may contain hemorrhage. Recognition of these physiological processes helps explain why many cysts resolve during observation.¹

A hemorrhagic cyst may contain reticular internal echoes or a retracting clot that resembles a solid component. Absence of blood flow within the clot and the overall sonographic pattern help distinguish it from vascularized tissue. When diagnostic uncertainty remains, interval imaging can establish resolution.⁸

Benign pathological ovarian lesions

Common benign pathological lesions include endometriomas, mature cystic teratomas, and serous or mucinous cystadenomas. Their management depends on the confidence of imaging diagnosis and the clinical consequences of observation or treatment.

Endometriomas often contain homogeneous low-level, or ground-glass, echoes. Treatment decisions should account for pain, fertility plans, ovarian reserve, previous surgery, and any atypical imaging features. The expected benefit of surgery must be weighed against its potential effect on ovarian function.⁹

Mature cystic teratomas may contain echogenic material, calcification, and acoustic shadowing. A characteristic appearance can support surveillance in selected patients, although symptoms, growth, and complications may alter management.⁸

Serous cystadenomas are often thin-walled cystic lesions, whereas mucinous cystadenomas may be large and multilocular. Ultrasound can suggest these diagnoses but does not establish histology. Decisions about surgery should reflect symptoms, growth, and diagnostic confidence.^{1,8}

Indeterminate and suspicious masses

The description “complex ovarian cyst” is insufficient to determine risk because it includes both benign and malignant lesions. Reports should instead describe the relevant cystic and solid components using standardized terminology.³ Irregular solid tissue, papillary projections, ascites, and strong internal vascularity increase concern for malignancy. These findings must be interpreted as part of the complete examination rather than as isolated diagnostic criteria.⁴

Table 1: Common adnexal masses and typical sonographic characteristics.

Lesions	Typical ultrasound characteristics	General clinical approach
Simple/follicular cyst	Unilocular, anechoic, thin smooth wall, no solid component	Usually conservative
Hemorrhagic cyst	Reticular/lacy internal echoes; retracting clot; no internal vascularity within clot	Short-interval reassessment when appropriate
Corpus luteum	Thick wall, peripheral vascularity, variable internal hemorrhage	Usually conservative unless complicated
Endometrioma	Homogeneous low-level “ground-glass” echoes	Individualize according to symptoms, fertility and morphology
Mature cystic teratoma	Echogenic components, shadowing, calcification or fat-fluid features	Surveillance or surgery depending on size, symptoms and circumstances
Serous cystadenoma	Usually thin-walled uni- or multilocular cyst	Individualized
Mucinous cystadenoma	Frequently large and multilocular with variable internal echogenicity	Individualized
Suspicious neoplasm	Irregular solid components, papillary projections, ascites and/or marked vascularity	Further assessment and oncology referral where appropriate

*Typical appearances support characterization but do not establish histology. Descriptions are summarized from IOTA and SRU publications.^{3,8}

CLINICAL ASSESSMENT

Clinical assessment should establish whether the lesion was detected incidentally, in association with persistent symptoms, or during an acute presentation. History should include menstrual and reproductive status, previous ovarian surgery, endometriosis, malignancy, and family history.

Persistent abdominal distension, early satiety, pelvic or abdominal pain, and urinary symptoms may warrant investigation for ovarian cancer. Symptoms are nonspecific, but their persistence and frequency should influence assessment and safety-netting.¹⁰

Sudden unilateral pain with nausea or vomiting raises concern for torsion. Rupture and hemorrhage are alternative explanations, and pregnancy-related causes of pain must also be considered when relevant. Urgent assessment should not be delayed while completing an elective malignancy-risk algorithm.¹¹

Fertility plans and the consequences of ovarian surgery should be discussed early. A personal or family history suggesting hereditary cancer risk requires appropriate specialist assessment and may alter management despite reassuring imaging.²

ULTRASOUND ASSESSMENT

TVUS is the first-line imaging investigation. Transabdominal ultrasound complements it when a lesion extends beyond the pelvis or cannot be fully assessed transvaginally.¹

The report should document lesion origin, laterality, dimensions, locularity, wall and septal characteristics, internal echogenicity, solid tissue, papillary projections, acoustic shadows, Doppler vascularity, ascites, and associated abnormalities. IOTA terminology was updated in 2026 to clarify definitions and measurements used in lesion characterization and prediction models.^{3,12}

Morphology should be considered alongside size. A large, confidently characterized simple cyst can have a lower malignancy risk than a smaller lesion containing irregular vascularized solid tissue. Size remains relevant to symptoms, imaging completeness, and management feasibility.¹³

Magnetic resonance imaging (MRI) is useful when ultrasound cannot confidently characterize a lesion, particularly when solid tissue is suspected. O-RADS MRI provides a separate risk-stratification framework based on MRI findings.¹⁴ A prospective multicenter study supported its diagnostic performance in sonographically indeterminate masses, although the study included women of different ages and was not restricted to premenopausal patients.¹⁵

IOTA SIMPLE RULES

The IOTA Simple Rules use five benign and five malignant ultrasound features. Prospective validation demonstrated useful discrimination when the rules gave a conclusive result.⁴

The benign features are a unilocular cyst (B1), a solid component with its largest diameter below 7 mm (B2), acoustic shadows (B3), a smooth multilocular tumor smaller than 100 mm (B4), and no detectable Doppler blood flow (B5).⁴

The malignant features are an irregular solid tumor (M1), ascites (M2), at least four papillary structures (M3), an irregular multilocular-solid tumor measuring at least 100 mm (M4), and very strong Doppler blood flow (M5).⁴

A mass is classified as benign when at least one benign feature and no malignant feature are present, and as malignant when at least one malignant feature and no benign feature are present. The presence of both benign and malignant features, or the absence of both, produces an inconclusive result.⁴

An inconclusive result is not a diagnosis of cancer. Expert ultrasound, a suitable prediction model, or MRI may clarify the lesion before management is selected.^{2,14}

IOTA ADNEX MODEL

ADNEX estimates the probability of a benign tumor, borderline tumor, stage I invasive ovarian cancer, stage II–IV invasive ovarian cancer, or secondary metastatic tumor. It combines clinical and sonographic variables and can be calculated with or without CA125.⁵

A systematic review of 47 external-validation studies found good overall discrimination, with a summary area under the receiver operating characteristic curve of approximately 0.93 in surgical populations, both with and without CA125. However, calibration was infrequently assessed and most validations judged at high risk of bias.¹⁶

Risk estimates should therefore inform clinical decisions without replacing judgment. Applicability depends on ultrasound quality, case mix and clinical setting; published performance from surgical cohorts cannot automatically be assumed in all incidentally detected cysts.¹⁶

O-RADS ULTRASOUND

O-RADS US standardizes lesion description and assignment of malignancy risk. O-RADS 0 denotes an incomplete examination and O-RADS 1 a normal ovary or physiological finding. O-RADS 2 indicates an almost certainly benign lesion with a malignancy risk below 1%; O-RADS 3 indicates low risk, from 1% to below 10%; O-RADS 4 indicates intermediate risk, from 10% to below 50%; and O-RADS 5 indicates high risk, at least 50%.^{6,17}

O-RADS 3 should not be used as a synonym for an uncharacterized mass. Under the v2022 recommendations, a lesion in this category that is not excised may undergo ultrasound follow-up within six months; solid lesions may benefit from specialist ultrasound or MRI.^{7,17}

O-RADS 4 warrants management involving a gynecologist with gynecological oncology consultation, or a gynecological oncologist, while O-RADS 5 warrants gynecological oncology management. Further imaging may assist characterization, but should not delay appropriate referral.¹⁷

The suggested management pathways assume an average-risk patient without acute symptoms. Symptoms, hereditary risk, pregnancy, and fertility considerations may justify a different approach even when the imaging category is unchanged.⁷

SELECTIVE USE OF TUMOR MARKERS

An ovarian cyst does not by itself justify a broad tumor-marker panel. Testing should address plausible differential diagnoses and be interpreted with clinical and imaging findings. False positive results are particularly problematic when the pretest probability of malignancy is low.² Table 2 summarizes the main clinical indications and limitations of commonly used markers.

CA125

CA125 is used in the assessment of suspected epithelial ovarian cancer, but benign gynecological and inflammatory conditions reduce its specificity in premenopausal women.

Endometriosis, fibroids, pelvic infection, menstruation, and pregnancy may be associated with raised CA125. Conversely, a normal concentration does not exclude early epithelial ovarian cancer.¹

Routine CA125 measurement is unnecessary when ultrasound confidently identifies a simple ovarian cyst.¹ In

secondary care, NICE recommends CA125 measurement in women with suspected ovarian cancer if it has not already been obtained.¹⁸

Germ-cell tumor markers

Germ-cell tumors are an important differential diagnosis in younger women with a suspicious complex or solid mass. NICE recommends alpha-fetoprotein (AFP) and beta-human chorionic gonadotropin (β -hCG), in addition to CA125, in women younger than 40 years with suspected ovarian cancer.¹⁸

RCOG also recommends AFP, β -hCG, and lactate dehydrogenase (LDH) in women younger than 40 years with a complex ovarian mass.¹ LDH is relevant to suspected dysgerminoma, but is nonspecific and must be interpreted with the other findings.¹⁹

Sex-cord stromal tumor markers

Inhibin, anti-Müllerian hormone (AMH), or estradiol may assist evaluation when a granulosa-cell or other sex-cord stromal tumor is suspected. Selection depends on the clinical and endocrine presentation and suspected histological subtype; these are not routine tests for a simple cyst.¹⁹

HE4 and ROMA

Human epididymis protein 4 (HE4) and the Risk of Ovarian Malignancy Algorithm (ROMA), which combines HE4, CA125, and menopausal status, have been evaluated as adjuncts for adnexal-mass assessment. Their use should follow a defined local pathway rather than indiscriminate testing.²

The European multidisciplinary consensus favors ultrasound-based assessment and does not support HE4 or ROMA as a replacement for expert morphology or validated ultrasound models. Biomarker results should not override suspicious imaging or postpone specialist referral.²

Table 2: Practical use of tumor markers in premenopausal adnexal masses.

Clinical situations	Biomarker(s) to consider	Important limitation
Clearly simple ovarian cyst	Usually none	Routine CA125 is unnecessary
Suspicious epithelial-type mass	CA125	Limited specificity in premenopausal women
Suspicious mass in a woman younger than 40 years	CA125, AFP, β -hCG; LDH for a complex mass under RCOG guidance	Interpret with imaging, age, and clinical findings
Suspected dysgerminoma	LDH with other germ-cell markers as appropriate	LDH is nonspecific
Suspected granulosa-cell tumor	Inhibin A/B; AMH or estradiol when appropriate	Select according to endocrine and imaging findings
Selected indeterminate mass	HE4 or ROMA only within an established local pathway	Does not replace expert ultrasound or oncology referral

*AFP, alpha-fetoprotein; β -hCG, beta-human chorionic gonadotropin; LDH, lactate dehydrogenase; AMH, anti-Müllerian hormone; HE4, human epididymis protein 4; ROMA, Risk of Ovarian Malignancy Algorithm. Recommendations reflect the clinical contexts described in RCOG, NICE, European consensus, and ESMO guidance.^{1,2,18,19}

RISK OF MALIGNANCY INDEX

The Risk of Malignancy Index (RMI), originally described by Jacobs and colleagues, combines ultrasound findings, menopausal status, and CA125.²⁰

RMI I is calculated as $U \times M \times CA125$, where U is the ultrasound score, M the menopausal score, and CA125 the serum concentration in IU/mL. Ultrasound findings considered are multilocularity, solid areas, bilateral lesions, ascites, and metastases. U is 0 when none is present, 1 for one finding, and 3 for two or more; M is 1 in premenopausal women and 3 after menopause.¹⁸

NICE recommends referral to a specialist multidisciplinary team when RMI I is at least 250.¹⁸ This threshold belongs to that specific pathway and should not be treated as a universal cutoff for all clinical settings.

RMI is affected by benign CA125 elevations and by tumors that produce little CA125. Ultrasound models may provide additional discrimination, particularly when an RMI result does not fit the morphology or clinical presentation.²

CONSERVATIVE MANAGEMENT

Observation is appropriate for many lesions with reassuring morphology. In a large unselected ultrasound population, simple cysts were not associated with an increased ovarian-cancer risk; no cancers were identified in women younger than 50 years who had a simple cyst.²¹

The 2011 RCOG guideline recommends no routine follow-up for simple cysts smaller than 50 mm, ultrasound surveillance for cysts measuring 50-70 mm, and consideration of further imaging or surgery for larger cysts because complete ultrasound assessment may be difficult.¹

More recent imaging guidance differs. The 2019 Society of Radiologists in Ultrasound (SRU) update uses a follow-up threshold above 5-7 cm in premenopausal women, depending on imaging quality and confidence.¹³ O-RADS US v2022 recommends no follow-up for simple cysts up to 5 cm and ultrasound at 12 months for those larger than 5 cm but smaller than 10 cm.¹⁷ These recommendations apply to appropriately characterized lesions and should not be combined into a single automatic surgical threshold.

Prospective IOTA5 data support observation after a lesion has been judged benign on ultrasound. Among 1,919 newly diagnosed masses managed conservatively, the two-year cumulative incidences were 0.4% for invasive malignancy, 0.3% for borderline tumor, 0.4% for torsion, and 0.2% for rupture. These estimates describe a selected cohort, including both premenopausal and postmenopausal women, rather than every adnexal mass.²²

For a classic hemorrhagic cyst larger than 5 cm in a reproductive-age woman, the SRU statement recommends

repeat ultrasound in 6-12 weeks to confirm resolution. A shorter interval also helps distinguish a resolving hemorrhagic cyst from an endometrioma when the initial appearance is uncertain.⁸

Follow-up should establish whether the lesion has resolved, remained stable, enlarged, developed suspicious morphology, or become symptomatic. Persistent lesions require reassessment of the diagnosis, but persistence alone does not mandate oophorectomy. Patients should receive advice about symptoms that require urgent review.^{1,22}

Combined oral contraceptives should not be prescribed solely to hasten resolution of an existing functional cyst. A Cochrane review of eight randomized trials involving 686 women found no benefit for this purpose.²³

INDICATIONS FOR SURGERY

Surgery may be appropriate for symptoms attributable to the mass, progressive growth, substantial pressure effects, inability to characterize a lesion adequately, or concern for malignancy. Torsion and clinically significant rupture or hemorrhage require urgent assessment. Large size can complicate imaging or surveillance, but is not sufficient by itself to establish a surgical indication.¹

The decision should integrate morphology, symptoms, change over time, reproductive goals, ovarian reserve, previous surgery, and the risks of both observation and intervention. Discussion should include the possibility that a planned cystectomy may require a different procedure if operative findings make ovarian preservation unsafe.

SURGICAL APPROACH AND OVARIAN PRESERVATION

For a presumed benign ovarian mass, laparoscopy is generally preferred when technically feasible and appropriate expertise is available. Randomized evidence summarized in a Cochrane review found less postoperative pain, fewer adverse events, and shorter hospitalization than with laparotomy, although the trials were relatively small and concerned lesions selected as benign.²⁴

Cystectomy can preserve ovarian tissue in women requiring surgery for suitable benign lesions. The choice of procedure should account for the amount of residual normal ovary, technical feasibility, and oncological safety. Operative planning should include specimen retrieval and measures to minimize avoidable intraperitoneal spillage.¹

Endometrioma surgery requires particular caution. A meta-analysis found a postoperative reduction in AMH after excision, supporting counseling about possible loss of ovarian reserve.²⁵ ESHRE advises against routine endometrioma surgery before assisted reproduction solely to improve live birth rates, because benefit has not been

demonstrated and surgery may harm ovarian reserve. Surgery may still be considered for pain or follicle accessibility.⁹

If endometrioma surgery is otherwise indicated, the technique should minimize ovarian damage. Previous surgery, bilateral disease, baseline reserve, and reproductive plans should inform counseling; preservation of tissue must remain compatible with adequate treatment.⁹

When malignancy is suspected, operative planning belongs within a specialist pathway. Ovarian conservation should not compromise appropriate diagnosis, staging, or treatment.^{18,19}

GYNECOLOGICAL ONCOLOGY REFERRAL

Referral is warranted when the integrated assessment raises concern for malignancy. Findings may include irregular solid tissue, multiple papillary projections, ascites, strong internal vascularity, metastatic disease, or abnormal markers consistent with the suspected tumor type.^{4,18}

An O-RADS 4 lesion requires oncology involvement or consultation, while O-RADS 5 requires gynecological oncology management. An RMI I of at least 250 meets the NICE threshold for specialist multidisciplinary review. A low marker value should not prevent referral when morphology is suspicious.^{17,18}

Specialist assessment allows appropriate planning of the initial operation and discussion of staging and fertility-preserving options where relevant. Referral should precede elective surgery when malignancy is a realistic concern.^{18,19}

SPECIAL CONSIDERATIONS IN ADOLESCENTS AND YOUNG WOMEN

The differential diagnosis changes with age. Germ-cell tumors deserve particular attention in adolescents and young adults, and the assessment should not rely only on pathways developed predominantly for epithelial malignancy.

AFP, β -hCG, and LDH are relevant when a complex or solid lesion raises concern for a germ-cell tumor. Their interpretation requires attention to the clinical setting, including the possibility of pregnancy.^{1,19}

For benign lesions, treatment should preserve normal ovarian tissue where feasible. Selected patients with non-epithelial malignancy may also be candidates for fertility-sparing treatment, but the decision depends on tumor type, stage, and specialist multidisciplinary assessment.¹⁹

COMPLICATIONS

Ovarian torsion

Ovarian torsion is a surgical emergency. Sudden or intermittent unilateral pain with nausea or vomiting is a typical presentation. Ultrasound supports assessment, but preserved Doppler flow does not exclude torsion.¹¹

When clinical suspicion is high, timely surgical evaluation is required. In adolescents, ACOG recommends detorsion and preservation of adnexa whenever feasible, irrespective of the initial appearance of the ovary; oophorectomy is reserved for situations in which it is unavoidable.¹¹

Cyst rupture and hemorrhage

Rupture or hemorrhage can cause acute pain and intraperitoneal bleeding. Assessment includes hemodynamic status, symptom progression, hemoglobin, and imaging, with pregnancy-related causes considered where appropriate.

Stable patients may be observed with reassessment, whereas instability or evidence of continuing significant bleeding may require surgery. These acute decisions should be separated from elective cyst-surveillance recommendations, which do not address emergency management.¹

Infection

Fever, pelvic tenderness, inflammatory abnormalities, and a complex adnexal lesion should prompt consideration of pelvic inflammatory disease or tubo-ovarian abscess rather than assuming an uncomplicated ovarian cyst. Management then follows the infectious differential diagnosis and severity of illness.

A PRACTICAL MANAGEMENT PATHWAY

The practical pathway begins with assessment of clinical urgency. Severe acute pain, suspected torsion, or significant bleeding requires prompt evaluation, stabilization when necessary, and surgical review. An elective risk score should not delay this process.¹¹

For a stable patient, ultrasound should establish the origin and morphology of the lesion. Standardized description and an appropriate risk tool can then distinguish a confidently benign finding from a low-risk, intermediate-risk, or high-risk lesion. An incompletely assessed mass requires further characterization rather than assignment to a risk category by assumption.^{7,17}

A confidently benign lesion may need reassurance alone or surveillance according to its type and size. Growth, new symptoms, or morphological change should trigger reassessment. A low-risk O-RADS 3 lesion may be observed under the relevant pathway, with specialist

ultrasound or MRI particularly useful for solid lesions. Intermediate- and high-risk lesions require the corresponding oncology pathway.¹⁷

Tumor markers should be selected after considering age, imaging, and the differential diagnosis. Clinical and imaging findings determine whether the next step is observation, additional imaging, benign gynecological surgery, or specialist oncological management.^{2,18}

At each stage, counseling should address fertility, ovarian reserve, patient preferences, and the benefits and risks of intervention. Ovarian preservation is an operative objective when surgery is necessary and oncologically appropriate.

Table 3 summarizes the management options while distinguishing older RCOG size thresholds from contemporary imaging guidance.^{1,9}

Table 3: Practical management options and guideline context.

Findings	Suggested approach
Simple cyst smaller than 50 mm, asymptomatic	Usually reassurance; routine follow-up is generally unnecessary.
Simple cyst measuring 50-70 mm	RCOG recommends ultrasound surveillance; contemporary guidance differs at the 5 cm boundary.
Simple cyst larger than 70 mm	RCOG advises considering further imaging or surgery; O-RADS permits surveillance of confidently simple cysts below 10 cm.
Typical hemorrhagic cyst	Conservative management; SRU advises repeat ultrasound in 6–12 weeks if larger than 5 cm.
Typical endometrioma	Individualize according to pain, reproductive plans, ovarian reserve, and morphology.
Typical dermoid	Surveillance or surgery according to symptoms, size, growth, and patient factors.
Persistent or enlarging lesion	Reassess morphology and diagnosis; consider additional imaging or surgery when indicated.
Indeterminate lesion	Expert ultrasound, a suitable prediction model, and/or MRI.
Suspicious solid or papillary lesion, marked vascularity, or ascites	Selective tumor markers and appropriate gynecological oncology assessment.
Acute pain with suspected torsion	Urgent surgical assessment; normal Doppler flow does not exclude torsion.

*The simple-cyst size bands reproduce the RCOG 2011 framework and are not automatic indications for surgery. O-RADS US v2022 recommends no follow-up for a simple cyst up to 5 cm and ultrasound at 12 months for a simple cyst larger than 5 cm but smaller than 10 cm. Symptoms, imaging quality, and individual risk may alter management. MRI, magnetic resonance imaging; SRU, Society of Radiologists in Ultrasound.^{1,8,9,11,17}

DISCUSSION

The evidence supports an approach in which ultrasound morphology is interpreted with clinical findings and reproductive priorities. This reduces reliance on cyst diameter or a single biomarker, neither of which adequately captures the range of adnexal pathology in premenopausal women.

The IOTA models and O-RADS provide complementary ways to describe risk. Their use requires consistent measurements and terminology, for which the 2026 IOTA consensus provides updated guidance.¹² They do not eliminate uncertainty, and diagnostic performance depends on operator expertise and the population examined.¹⁶

Surveillance can prevent unnecessary intervention when benign morphology is established. The low complication rates in IOTA5 are reassuring, but selection for conservative management and access to follow-up are important qualifications. These findings should not be

extrapolated to symptomatic, poorly characterized, or suspicious masses without reassessment.²²

Tumor-marker testing remains selective. CA125 is limited by benign elevations and incomplete sensitivity, while age and morphology may indicate investigation for non-epithelial malignancy. The same marker panel is therefore not appropriate for every cyst.^{1,18,19}

Guideline differences should be made explicit. RCOG's published premenopausal-mass guideline dates from 2011, with a second edition in development at the time of this revision.¹ SRU and O-RADS recommendations reflect subsequent imaging evidence and use different follow-up thresholds. A service should apply a coherent pathway while allowing symptoms, imaging limitations, and individual risk to modify management.^{13,17}

The reproductive consequences of treatment deserve equal attention. Surgery for a lesion that is benign on imaging may be justified by pain, growth, or uncertainty, but its expected benefit should outweigh the risk of ovarian

damage. Endometrioma management is particularly sensitive to this balance.^{9,25}

This review has limitations. As a narrative synthesis, it does not provide an exhaustive search, formal study-quality assessment, or pooled estimates. Several cited diagnostic and surveillance studies include women of mixed menopausal status, and surgical cohorts may overrepresent higher-risk lesions. Recommendations are also drawn from different health systems. The proposed pathway should consequently be interpreted within local referral arrangements and available imaging expertise.

Future perspectives

Further research should assess whether risk-based pathways reduce unnecessary intervention without delaying cancer diagnosis. Useful outcomes include complications during surveillance, operations for benign disease, ovarian reserve, fertility, patient-reported burden, and cost.

Artificial intelligence may support ultrasound interpretation, but its clinical role requires external validation and comparison with established assessment by trained clinicians. Prospective studies should examine performance across institutions and relevant patient groups before routine adoption.²

Novel circulating biomarkers and molecular approaches remain areas of investigation. Their value will depend on whether they add clinically useful information beyond imaging and existing prediction models rather than merely demonstrating discrimination in selected research cohorts.²

For established models, improved reporting of calibration and evaluation in conservatively managed populations would strengthen clinical interpretation. Future work should also clarify when surveillance can safely stop and how patients experience repeated testing.^{16,22}

CONCLUSION

Most ovarian cysts in premenopausal women are benign. Management should begin with clinical assessment and high-quality ultrasound, followed by selective investigation and a clear plan for observation, treatment, or referral.

IOTA and O-RADS can improve consistency of risk assessment when applied correctly. Tumor markers should answer a defined clinical question and should not override suspicious morphology or provide false reassurance.

Surveillance is appropriate for many confidently benign lesions, while symptoms, growth, uncertainty, or suspicious features may justify intervention. When surgery is required, preservation of ovarian function should be

pursued whenever compatible with safe and adequate treatment.

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