REVIEW ARTICLE

Adnexal masses in pregnancy: An updated review

Abdullah M. Hakoun, Iyad AbouAl-Shaar[1], Khaled J. Zaza, Hussam Abou-Al-Shaar, Mohammad Nour A. Salloum

College of Medicine, Alfaisal University, Riyadh, Saudi Arabia, [1]School of Medicine, Jordan University of Science and Technology, Irbid, Jordan

Access this article online

Website: www.avicennajmed.com

DOI: 10.4103/ajm.AJM_22_17

Quick Response Code:

ABSTRACT

Adnexal masses in pregnancy are not commonly encountered. The majority of these masses are discovered incidentally during routine follow-up. However, some of these masses become symptomatic due to their size, location, and impingement of adjacent structures. Several diagnostic modalities can be utilized for the detection of adnexal masses with different sensitivity and specificity rates. The differential diagnosis of adnexal masses discovered during pregnancy is broad and includes both benign and malignant lesions. The management of such lesions has been a subject of debate for years with no consensus regarding the best management plan. Tumor size, site, and the trimester of mass detection are all crucial in management. In this account, we review adnexal masses discovered in pregnancy, the diagnostic modalities utilized for detecting these lesions, their differential diagnosis, and management strategies.

Key words: Adnexa, management, mass, pregnancy, surgery

INTRODUCTION

The American College of Obstetrics and Gynecologists (ACOG) has released guidelines that describe the diagnostic approach and management of adnexal masses occurring outside of pregnancy. However, guidelines that dictate physicians' approaches to females with incidental adnexal masses during pregnancy remain vague. Having to consider both the pregnant female and her fetus when making decisions regarding the management plan makes it more complicated. The main concerns with pregnant females who develop adnexal masses are pregnancy complications and malignancies; timely management in this case is essential, without jeopardizing the health of the fetus. A review of the literature would help guide physicians when dealing with such cases.

Most adnexal masses discovered during pregnancy are incidental findings revealed on routine pregnancy investigations.[1-4] Previously, the detection rate of such masses was low, owing to the lack of technological advancements that facilitated early detection.[1] The detection of adnexal masses was predominantly based on clinical examinations of the adnexa, which underestimated their incidence during pregnancy. However, the incidence and detection rates of adnexal masses have increased tremendously with the application of ultrasonography in pregnancy follow-ups.[1,3,5] According to a recent study, adnexal masses are discovered in 1 per 76–1 per 2328 deliveries.[6]

In general, the majority of adnexal masses are discovered in the first two trimesters of pregnancy. Those that are functional regress spontaneously whereby 65%–80% of patients remain asymptomatic.[6] Nonetheless, to prevent complications related to mass torsion, rupture, labor obstruction, and malignancy, masses that persist beyond the first trimester or are first noted in the second trimester are usually resected.[6,7] Malignancy is usually associated with the presence of symptoms; an abdominal mass is the most common complaint in patients with adnexal malignancy.[6]

Address for correspondence: Dr. Mohammad Nour A. Salloum, College of Medicine, Alfaisal University, Riyadh 11533, Saudi Arabia. E-mail: mnsalloum@gmail.com

Cite this article as: Hakoun AM, AbouAl-Shaar I, Zaza KJ, Abou-Al-Shaar H, A. Salloum MN. Adnexal masses in pregnancy: An updated review. Avicenna J Med 2017;7:153-7.

DIAGNOSTIC EVALUATION

According to the ACOG guidelines, pelvic examinations have limited ability to identify adnexal masses, especially in patients whose body mass index is >30 kg/m^2, making it less reliable for detection and diagnosis.[8] Pelvic ultrasonography, however, is considered the modality of choice for evaluating adnexal masses discovered in pregnancy and is suitable for guiding surgical intervention if indicated.[1,6] Abdominal ultrasound can also be used later during pregnancy to investigate the possible displacement of the ovaries into the abdominal cavity. Ultrasonography is also important in monitoring adnexal masses to determine their progression or regression in size and character.[1] In addition, Doppler ultrasound can also be employed for further characterizing the lesion in relation to the blood flow.[1,5] It is thus important to note the different ultrasonographic features of various etiologies. Some features on ultrasound may raise the suspicion of malignancy, which include, but are not limited to the presence of solid components, multiloculated large tumors with increased wall thickness and maximum diameter >6 cm, gross internal septa (>2–3 mm), papillary projections, decreased resistance in blood flow during Doppler examination, or free abdominal/pelvic fluid. Further investigation with magnetic resonance imaging (MRI) helps obtain better morphological characteristics of the suspicious lesion.[5,6,8,9] Based on the ultrasound morphology, adnexal masses are categorized into high-, intermediate-, and low-risk groups. High-risk masses have features of malignancy such as being solid, nodular, with thick septations. Intermediate-risk masses are not anechoic and/or unilocular but do not have features of malignancy. Low-risk masses are anechoic unilocular fluid-filled cysts with thin walls.[10] It is worth noting that some lesions that have benign features on ultrasound, eventually turn out to be malignant at the time of surgery. Therefore, although false-negative ultrasonographic results are uncommon, they still can occur.[11]

It is estimated that up to 20% of adnexal masses cannot be adequately visualized for proper evaluation on ultrasound.[12] For such lesions, MRI is the modality of choice for better characterization and evaluation.[1,12] MRI has an accuracy rate of 93% in distinguishing between benign and malignant etiologies.[13] It is extremely useful in the diagnosis of adnexal masses suspected to be leiomyomas, as well as in paraovarian cysts.[3,14] MRI is generally safe in pregnancy, and no reports document adverse effects of its use on the mother or the fetus.[1,5] However, contrast materials containing gadolinium increase the risk of skeletal defects and malformations in animal studies and are therefore classified under drug category C in pregnancy.[1] It has also been shown that gadolinium-based contrasts can enter the fetal circulation and get excreted by the fetal kidneys into the amniotic fluid.[1]

Tumor markers are of low utility and validity during pregnancy. Cancer antigen 125 (CA 125), alpha-fetoprotein, lactate dehydrogenase, and human chorionic gonadotropin (hCG) are all usually elevated during the first trimester in pregnancy, thus limiting their potential efficacy.[2,4,15]

DIFFERENTIAL DIAGNOSIS

The differential diagnoses of adnexal masses in nonpregnant females can be of gynecologic or nongynecologic origin. Masses in premenopausal women usually have a gynecologic source and are mostly benign. Evaluation in this population depends on the presence or absence of symptoms; those with symptoms typically require immediate treatment. Evaluation may include a thorough medical history and physical examination, measurement of hCG, complete blood count, and transvaginal ultrasonography. Other studies such as hematocrit measurements and blood cultures may also be needed. In contrast, there should be a much higher index of suspicion for malignancy in postmenopausal women. Evaluation should include transvaginal ultrasonography and CA 125 antigen measurements. Most pelvic masses (excluding simple cysts) will require surgery. Keeping in mind that the ovaries can be sites of metastasis, other organs should be screened as well.[8]

In comparison, the differential diagnoses of adnexal masses found in pregnancy can be classified into neoplastic and nonneoplastic lesions. Most nonneoplastic masses, especially those <5 cm, will resolve spontaneously without surgical management.[1] Neoplastic lesions typically encompass both benign and malignant masses.

Ovarian cysts are the most commonly encountered masses in pregnancy. Corpus luteum cysts constitute 13%–17% of cystic masses in pregnancy.[4,16,17] The corpus luteum forms after ovulation and persists for 8–9 weeks during pregnancy. It produces progesterone early on until the placenta takes over. Failure of resolution of the corpus luteum at the end of those 9 weeks leads to the development of cysts.[1,17] Cysts containing clotted blood (hemorrhagic cysts) can also be seen in pregnancy. Follicular cysts are the most common functional cysts, which occur under the influence of hormonal changes in pregnancy. They represent a follicle that failed to ovulate and regress spontaneously.[1]

Endometrioma, also known as chocolate cyst, can also be present in the adnexa of pregnant patients.

After 16 weeks of gestation, the most commonly encountered cystic adnexal lesion is usually a teratoma (dermoid cyst). These lesions are generally benign with <2% malignant transformation rate into invasive squamous carcinoma.[1,17]

The incidence of an adnexal cancer in pregnancy is one per 12,000–47,000. It is, therefore, considered the second most common gynecological mass detected in pregnancy following benign cysts.[18] Although epithelial malignancies are the most common, dysgerminoma is the most commonly encountered malignancy in pregnancy.[1] Other germ cell tumors can also be encountered in pregnancy but less frequently.[1] Sex cord-stromal tumors may occur in pregnancy, and fibromas dominate among this group. Sex cord-stromal tumors usually present at an early stage and the patient may be managed surgically.[1] Ovarian epithelial tumors include a variety of histologically different benign and malignant tumors. Cystadenomas, cystadenocarcinomas, and tumors of low malignant potential are the most common neoplasms.[1,17] Up to 50% of benign ovarian tumors in nonpregnant women are cystadenomas. The serous type is the most frequently noted histological neoplasm.[1] Transformation of benign lesions into malignancies is extremely rare, but it has been reported in the literature.[1] Cystadenocarcinomas are malignant epithelial neoplasms characterized by papillary projections, thick septations, and asymmetrical walls.[1] As noted with sex cord-stromal tumors, the majority of epithelial malignancies are discovered at early stages.[6] Metastatic ovarian tumors are not commonly seen in pregnancy. It is estimated that 10% of ovarian cancers are metastatic. Breast, gastric, and intestinal cancers have been documented as the primary areas of tumor origin. These tumors are generally solid and bilateral. Krukenberg tumors are signet-ring cell cancers that occur primarily in the stomach and metastasize bilaterally as a solid neoplasm on both ovaries.[1]

Hyperstimulated ovaries can also be seen in pregnancy, especially in patients who received ovulation induction therapy. The ovaries are generally large and are at an increased risk of torsion. Hyperstimulated ovaries typically regress in almost 90% of the cases.[17,19] Pregnant women with extremely high levels of hCG are at an increased risk of developing hyperreactio luteinalis.[1] High hCG levels can be encountered in multiple gestations, gestational trophoblastic disease, hyperthyroidism, and gonadotropin therapy. This condition can be entirely asymptomatic, or it may present with abdominal symptoms, respiratory complaints, abnormal liver function tests, or hirsutism.[1,3,17]

Patients who have polycystic ovarian syndrome, as well as patients with hyperandrogenism, are at an increased risk of having hyperreactio luteinalis. Moreover, theca lutein cysts have also been associated with high hCG levels. Treating the underlying cause of the high hCG usually causes regression of these cysts.[1] Luteoma of pregnancy is another cystic lesion that can be encountered in pregnancy. It occurs due to the replacement of the normal ovarian parenchyma by the proliferating luteinized stromal cells. Maternal and fetal virilization may occur with these cysts due to the inherent capacity of stromal cells to produce androgens.[1,17]

Paraovarian cysts are embryological remnants of the paramesonephric or mesonephric ducts. They typically occur in the mesosalpinx and are not clinically significant. Dilatation of the fallopian tube (hydrosalpinx) can also be discovered in pregnancy. Hydrosalpinx usually occurs due to salpingitis or endometriosis with resultant adhesions and distal obstruction.[1,17] Leiomyomas are the most commonly encountered solid neoplasms in pregnancy. The uterus is the region of origin of these neoplasms. However, if pedunculated, these neoplasms can be confused with adnexal masses. Due to hormonal changes in pregnancy, these neoplasms may grow larger and become symptomatic. In addition, red degeneration of leiomyomas can occur during pregnancy when they outgrow their own blood supply.[1]

In general, large lesions, regardless of whether they are neoplastic or not, carry an increased risk of torsion, labor obstruction, and even rupture.[1,17,20] It has been reported that pregnant patients have a 1% increased risk of ovarian torsion compared to nonpregnant patients. Most of the ovarian torsion cases occur in the first trimester in pregnancy. Thereafter, the risk of torsion decreases as the enlarging uterus limits the flexibility and mobility of the ovaries.[1,17]

The differential diagnosis of adnexal masses should also include inflammatory/infectious processes, as well as nongynecological etiologies as well. Pelvic inflammatory disease with tubo-ovarian abscess, appendicitis, diverticulitis, and others can also present as adnexal masses.[1] Thus, detailed history, physical examination, laboratory workup, and knowledge of the different radiological features accompanied with of each of the aforementioned masses, are all essential to establish the proper diagnosis and guide surgical or medical treatment.

MANAGEMENT

The management of adnexal masses discovered in pregnancy is controversial.[2,4,6,21,22] Some authors advocate for surgical

intervention in the second trimester.[6] Others, however, believe that observation is adequate since most lesions will spontaneously resolve during or after pregnancy.[5,6,23,24] Surgical intervention carries its own risks on the mother and her fetus, while observation may encourage the spread of the tumor and lead to unfavorable sequelae such as torsion or rupture.[20,25,26] Observation is reasonable when the patient is asymptomatic and the ultrasonographic features indicate a benign etiology.[2,5,21,27] Surgical intervention (laparotomy or laparoscopy) is usually indicated in cases of mass persistence, enlargement, rupture, torsion, hemorrhage, or high suspicion of malignancy.[5,6] In the presence of acute symptoms, masses should be managed surgically at the time of presentation.[6] The advantage of laparoscopy over laparotomy is the reduction in hospital stay, narcotic demand, postoperative pain, and uterine manipulation and irritation. It also allows for earlier postoperative ambulation, thus decreasing the risks of thromboembolic events.[5,28] However, the effects of pneumoperitoneum using CO_2 in developing fetal acidosis are still controversial and require further investigation.[5,29] Cyst aspiration should not be considered, as it is not always therapeutic, even with benign masses. In addition, it carries a risk of spillage or seeding of cancer cells into the peritoneal cavity, altering the stage and prognosis. Due to cytology's low sensitivity in detecting malignancies (25–82 percent), aspiration is not recommended, rendering it a poor diagnostic modality.[8]

Masses that are discovered in the first trimester in asymptomatic patients should be evaluated by ultrasound looking for features of malignancy. If there is suspicion of malignancy, surgical intervention should be carried out, preferably in the second trimester (16–20 weeks) to avoid the risks of miscarriage if performed earlier, or preterm delivery if performed later.[6,11,28,30-32] If ultrasound fails to demonstrate malignant features, observation with reevaluation in the next fetal anatomy scan (18–22 gestational weeks) is deemed reasonable. As mentioned earlier, MRI is preferable whenever adequate evaluation of the mass is not possible by ultrasound. In masses discovered in the second trimester, a similar management plan can be applied, with reevaluation in the 32–36 gestational weeks. Finally, masses discovered in the third trimester with no evidence of malignancy can be managed at the time of cesarean section (if an obstetric indication of cesarean section is present) or 6 weeks after delivery.[6]

In comparison, the guidelines for managing adnexal masses in nonpregnant females of reproductive age are classified according to the risks obtained from US features. High-risk masses with features associated with malignancy or any adnexal mass combined with ascites and/or evidence of metastatic disease consistent with ovarian cancer require prompt surgery. Intermediate-/low-risk masses are usually monitored closely rather than surgically removed.[10]

PREGNANCY OUTCOMES

In a study done in 2015 by Nazer *et al*., there 7,785,583 deliveries were recorded between 2003 and 2011, of which 19,591 were diagnosed with ovarian masses during delivery, representing 0.25% of all deliveries, and 1:200 of these were malignant. The overall malignancy rate was 0.12/10,000 deliveries. Apart from the increased rate of cesarean sections, odds ratio (OR) 5.92 (95% confidence interval [CI] 4.12–8.40), and the risk of thrombosis, OR 5.52 (95% CI 1.96–15.53), there was no significant increase in maternal morbidity or mortality. However, prematurity, OR 2.24 (95% CI 1.48–3.40), was a significant newborn risk in women with malignant ovarian tumors. Newborns of women with ovarian mass had comparable risks of intrauterine growth restriction, preterm rupture of membranes, and intrauterine death.[33]

In another study, 16 pregnant patients underwent surgery to remove an adnexal mass. All but one had abdominal-pelvic pain. The mean gestational age at the time of surgery was 15 ± 6 weeks versus 13 ± 4 weeks in the laparoscopic and laparotomy groups, respectively (P = NS). All patients undergoing laparoscopy remained in the hospital for 1 day compared with a mean of 4.4 ± 1.1 days in the laparotomy group ($P < 0.0001$). Pregnancy outcomes were similar and uniformly good.[34]

CONCLUSION

Adnexal masses are usually discovered incidentally in 1 per 76–1 per 2328 pregnancies. The recent advances in routine imaging during pregnancy have led to an increased rate of detection of such masses. The management of adnexal masses in pregnancy depends on the nature and type of these masses determined by radiological studies as well as by any complications that may arise. We recommend that the evaluation of pregnant patients with pelvic masses to be similar to that of nonpregnant premenopausal females; however, imaging modalities should depend on gestational age. Abdominal ultrasonography can be used along with transvaginal ultrasonography in women who are in later stages of pregnancy. In cases where additional imaging is needed, MRI is the modality of choice due to the absence of fetal radiation risk. Asymptomatic simple cysts that are <6 cm in diameter are generally benign and may be managed conservatively with close US follow-ups. Indications for prompt surgical intervention for adnexal masses in pregnant

females include the presence of symptoms, which alerts for complications or progression of the mass and/or imaging findings suggestive of malignancy. The best surgical outcome is usually observed during the second trimester. Further studies are needed to evaluate the diagnostic modalities and the management options available for these masses.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Yacobozzi M, Nguyen D, Rakita D. Adnexal masses in pregnancy. Semin Ultrasound CT MR 2012;33:55-64.
2. Leiserowitz GS. Managing ovarian masses during pregnancy. Obstet Gynecol Surv 2006;61:463-70.
3. Glanc P, Salem S, Farine D. Adnexal masses in the pregnant patient: A diagnostic and management challenge. Ultrasound Q 2008;24:225-40.
4. Giuntoli RL 2nd, Vang RS, Bristow RE. Evaluation and management of adnexal masses during pregnancy. Clin Obstet Gynecol 2006;49:492-505.
5. Hoover K, Jenkins TR. Evaluation and management of adnexal mass in pregnancy. Am J Obstet Gynecol 2011;205:97-102.
6. Aggarwal P, Kehoe S. Ovarian tumours in pregnancy: A literature review. Eur J Obstet Gynecol Reprod Biol 2011;155:119-24.
7. Munnell EW. Primary ovarian cancer associated with pregnancy. Clin Obstet Gynecol 1963;30:983-93.
8. Graham L. ACOG releases guidelines on management of adnexal masses. Am Fam Physician 2008;77:1320-3.
9. Grigoriadis C, Eleftheriades M, Panoskaltsis T, Bacanu AM, Vitoratos N, Kondi-Pafiti A, *et al.* Ovarian cancer diagnosed during pregnancy: Clinicopathological characteristics and management. G Chir 2014;35:69-72.
10. Muto MG. Management of an adnexal mass. In: Post TW, Sharp HT, Goff B, Falk SJ, editors. UpToDate. Harvard Medical School: UpToDate; 2016. Available at: https://www.uptodate.com/contents/management-of-an-adnexal-mass [Last accessed on 2017 Apr 03].
11. Whitecar MP, Turner S, Higby MK. Adnexal masses in pregnancy: A review of 130 cases undergoing surgical management. Am J Obstet Gynecol 1999;181:19-24.
12. Adusumilli S, Hussain HK, Caoili EM, Weadock WJ, Murray JP, Johnson TD, *et al.* MRI of sonographically indeterminate adnexal masses. AJR Am J Roentgenol 2006;187:732-40.
13. Togashi K. Ovarian cancer: The clinical role of US, CT, and MRI. Eur Radiol 2003;13 Suppl 4:L87-104.
14. Curtis M, Hopkins MP, Zarlingo T, Martino C, Graciansky-Lengyl M, Jenison EL. Magnetic resonance imaging to avoid laparotomy in pregnancy. Obstet Gynecol 1993;82:833-6.
15. Sarandakou A, Protonotariou E, Rizos D. Tumor markers in biological fluids associated with pregnancy. Crit Rev Clin Lab Sci 2007;44:151-78.
16. Soriano D, Yefet Y, Seidman DS, Goldenberg M, Mashiach S, Oelsner G. Laparoscopy versus laparotomy in the management of adnexal masses during pregnancy. Fertil Steril 1999;71:955-60.
17. Schwartz N, Timor-Tritsch IE, Wang E. Adnexal masses in pregnancy. Clin Obstet Gynecol 2009;52:570-85.
18. Garrett WJ, Coppleson M, McInerney RJ. Ultrasound and ovarian cysts. Med J Aust 1990;152:52.
19. Chiang G, Levine D. Imaging of adnexal masses in pregnancy. J Ultrasound Med 2004;23:805-19.
20. Patton CL. Adnexal tumors in pregnancy. Surg Gynecol Obstet 1906;3:413-20.
21. Schmeler KM, Mayo-Smith WW, Peipert JF, Weitzen S, Manuel MD, Gordinier ME. Adnexal masses in pregnancy: Surgery compared with observation. Obstet Gynecol 2005;105(5 Pt 1):1098-103.
22. Levine D, Brown DL, Andreotti RF, Benacerraf B, Benson CB, Brewster WR, *et al.* Management of asymptomatic ovarian and other adnexal cysts imaged at US Society of Radiologists in Ultrasound consensus conference statement. Ultrasound Q 2010;26:121-31.
23. Bernhard LM, Klebba PK, Gray DL, Mutch DG. Predictors of persistence of adnexal masses in pregnancy. Obstet Gynecol 1999;93:585-9.
24. Condous G, Khalid A, Okaro E, Bourne T. Should we be examining the ovaries in pregnancy? Prevalence and natural history of adnexal pathology detected at first-trimester sonography. Ultrasound Obstet Gynecol 2004;24:62-6.
25. Shnider SM, Webster GM. Maternal and fetal hazards of surgery during pregnancy. Am J Obstet Gynecol 1965;92:891-900.
26. Caverly CE. Ovarian cyst complicating pregnancy. Am J Obstet Gynecol 1931;21:566-74.
27. Zanetta G, Rota S, Chiari S, Bonazzi C, Bratina G, Mangioni C. Behavior of borderline tumors with particular interest to persistence, recurrence, and progression to invasive carcinoma: A prospective study. J Clin Oncol 2001;19:2658-64.
28. Guidelines Committee of the Society of American Gastrointestinal and Endoscopic Surgeons, Yumi H. Guidelines for diagnosis, treatment, and use of laparoscopy for surgical problems during pregnancy: This statement was reviewed and approved by the Board of Governors of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), September 2007. It was prepared by the SAGES Guidelines Committee. Surg Endosc 2008;22:849-61.
29. Whiteside JL, Keup HL. Laparoscopic management of the ovarian mass: A practical approach. Clin Obstet Gynecol 2009;52:327-34.
30. Booth RT. Ovarian tumors in pregnancy. Obstet Gynecol 1963;21:189-93.
31. White KC. Ovarian tumors in pregnancy. A private hospital ten year survey. Am J Obstet Gynecol 1973;116:544-50.
32. Buttery BW, Beischer NA, Fortune DW, Macafee CA. Ovarian tumours in pregnancy. Med J Aust 1973;1:345-9.
33. Nazer A, Czuzoj-Shulman N, Oddy L, Abenhaim HA. Incidence of maternal and neonatal outcomes in pregnancies complicated by ovarian masses. Arch Gynecol Obstet 2015;292:1069-74.
34. Carter JF, Soper DE. Operative laparoscopy in pregnancy. JSLS 2004;8:57-60.