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## A COMPARATIVE EVALUATION OF THE DIAGNOSTIC EFFICACY OF MRI AND SONOGRAPHY WITH POST-SURGERY PATHOLOGIC REPORT ON DIAGNOSIS OF COMPLEX ADNEXAL MASSES

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Received on 06-03-2016

Accepted on 25-03-2016

### Abstract

**Background:** Adnexal mass is one of the most common cause of surgery in gynecology and the best therapeutic approach will be selected based on malignant or benign characteristics of the mass hence illumination the features all the mass is fundamental. Magnetic resonance imaging (MRI) is one of the suggested imaging methods to evaluate adnexal masses. The present study aimed to comparatively assess the diagnostic efficacy of MRI and sonography with post-surgery pathologic report on diagnosis of complex Adnexal Masses.

**Materials and Methods:** Sixteen women with known adnexal masses were enrolled in the study. After initial physical examination, they were underwent sonography and pelvic MRI with and without gadolinium enhancement. T1 sequences with and without fat suppression and T2 sequences were obtained in sagittal and axial sections. According to gathered data, ovary MR kinetic curves were calculated. After performing laparotomy or laparoscopy, pathology results were compared with MRI results and sensitivity, specificity and accuracy of MRI.

**Results:** Sensitivity, specificity, and accuracy of MRI were 87.5%, 75%, and 63.5% respectively in diagnosis of adnexal masses and sensitivity and specificity of sonography was 37% and 62%, respectively in diagnosis of adnexal masses.

**Conclusion:** According to our result and other previous studies, MRI is an appropriate modality in diagnosis the malignant or benign adnexal masses in those cases that sonographic results are equivocal.

**Keywords:** Adnexal mass, MRI, Sonography, Sensitivity, Specificity.

### Introduction

Adnexal mass is actually an enlarged anatomical structure in uterine adnexal area that either is touched in a manual pelvic examination or is seen on imaging techniques (1). The origin of adnexal masses can be benign and malignant

tumors of the ovary, masses with fallopian tube origin, masses with origin of the urinary tract, masses resulting from remains of fetus periods, endometriosis, pelvic inflammatory disease, Follicular cysts ,and corpus luteum cysts (2). Ovarian cancer is a leading cause of death of gynecologic cancers with an estimate of 21,550 new cases and 14600 death cases in the United States in 2009. The morbidity risk is resulting from invasive ovarian cancer during the life of 1 person in every 95 people (3).

Early diagnosis of ovarian cancer is associated with beter prognostic factors. Therefore, screening tests are performed with transvaginal sonography which are based on random finding of adnexal masses (9). The main reason for the imaging of adnexal masses is distinguish malignant masses from benign. Although most adnexal masses are benign (10), if images view based on the patient's age and other risk factors does not show the benign lesion conclusively, Surgery may be preferred on the long-term prevention (11). As a general rule, although there are exceptions, benign masses have been cystic and have thin wall and sapta less than 3 millimeters. Malignant lesions are usually described so, that include internal complexity that determine despite mural nodules or thick septa. Presence of components of solid, necrosis inside of the solid component and bilateral ovarian masses are also malignant sign (12). The first diagnosis way of ovarian suspected cancers has been evaluation of transvaginal and have been found its sensitivity in detection of malignancies (13, 14).

Although the use of sonography due to its specificity reduction in the diagnosis of benign lesions that are about 60% - 95% and due to diagnosis of 20% of adnexal lesions is limited as indefinite (15). However, for the cases where sonography or clinical assessments failed to diangose, MRI is a relatively reliable option, however, for the unsettled objects, complementary tests are necessary (16, 17). For lesions that are unclear and indefinite in sonography, MRI increased the assessment property so reduces the resection of benign lesions (3, 12). Previous studies on the benefits of MRI have been concentrated in the diagnosis of benign lesions (leiomyoma, dermoid, endometrioma) (18-20) while recent articles have been reported MRI feature in ovarian malignanci es (16, 21, 22), borderline tumors are rarely diagnosed before surgery. Why so diagnosis views cannot be distinguished between benign tumor and early stage epithelial malignant tumors. Borderline tumors in MRI are often cystic with fluid view in T1 and T2 signals which is due to different concentrations of protein and mucin (23).

MRI gives the useful information about the nature of ovarian different masses whether neoplastic and whether non-neoplastic. Use of MRI images in the diagnosis of adnexal masses, Includes mass morphology and the nature of the signal intensity in the images T1, T2. MRI strategies are diagnosis of inconsistency signal intensity in ovarian masses

with morphology mass (24, 25), as regards for diagnosis of adnexal masses use laparotomy or laparoscopy surgery method in determination of tumor staging; in this study, trying to based on the reasonable evidences and proofes have been shown the role of MRI which is a non-invasive technique, in the diagnosis of adnexal high complex mass and as far as possible be prevented from sugery in benign cases and hospitalized patients.

## **Materials and Methods**

In this study, female patients of various ages that with Adnexal mass sign on physical examination were studied and sonography from November 2012 to November 2013 Imam and Razi hospital were referred to the Imam and Razi hospital clinic of Ahvaz. Then patients were studied for further investigation under pelvic MRI with and without injections. Images of T1 with and without fat suppression and T2 were collected a in the sagittal and axial sections. In these patients, tumor size, wash out time, solid component, Necrosis in solid lesion, thick septa > 3mm, vegetation in cyst, enhancement speed have been considered and was computed based on ovary MR kinetic curves data. Then such patients for implementation of laparotomy or laparoscopy surgery were referred to the department of women surgery. Sample for assessment was sent to pathology and its response was compared with MRI results. About the work way was explained to people and recorded and their satisfaction was obtained and recorded.

The obtained data was entered to the statistical package SPSS where descriptive analyses were performed. Sensitivity and specificity of MRI was expressed as percent and from  $\chi_0$  method was used for MRI comparison with sonography method and Pathology response.

Due to sonography for patients has not little risk and cost and MRI also is safe and surgery of laparotomy or laparoscopy is a part of their disease detection method, so this plan seems morally; however, after patients selection, project process was explained to them.

## **Results**

In this study were studied 16 women with age range 15 to 77 years old and the age mean 37.37 years old (SD: 1.71 years old) who had adnexal masse. The age mean of menarche 84.11 (SD: 1.21 years old). The number of pregnancy cases from 0 to 7 was various (Figure 1) and 25 percent of studied people were single and 75 percent was married. Patients were referred with different clinical complaints that the most common of it was pain (Figure 2).

Physical examination findings include touch of mass, abdominal swelling showed that there were not any signs in 75% of cases (Figure 3). The pathologic results were indicative eight cases of malignant and benign mass. The obtained results of sonography study and MRI are respectively shown in figures 4 and 5. The sensitivity, specificity,

and MRI accuracy in the adnexal diagnosis of benign and malignant masses was respectively 37 percent and 63 percent (Table 1) while the sensitivity and specificity of sonography in the diagnosis of adnexal benign and malignant masses was respectively 37 percent and 63 percent (Table 2). 37 and 19 percent of the reported cases respectively included indeterminable cases in sonography and MRI that in the case of MRI, 67% of indeterminable cases by pathology was reported benign and other 33 percent malignant. In addition, sonography 33% of indeterminable cases by pathology were benign and 67% of them were malignant which could mean that when sonography cannot be differentiated the cases in term of benign and malignant, it is more likely to be malignant.

## Discussion

When an adnexal mass be seen on sonography with MRI can be considerably confirmed benign or malignant masses. MRI is a method of efficient detection in confirmation of ovarian malignancies because connotative indicators on malignancy clearly have proved. Some MRI findings are in favor of malignancy which contains masses of solid or lubricating solid cystic that have diameter of more than 4 cm and finger-like excrement and numerous septa of mass inside and have thick wall. In addition, presence of necrosis in a solid mass and also presence of intramural bleeding are in favor of malignancy (12).

The combined use of sonography and MRI can reduce lack of recognition non-malignant tumors. It is true that perhaps the first suitable imaging method be sonography in dealing with s ovarian masses but MRI makes it possible to be raised the detections of proportionate with underlying pathology and also have high specificity in the diagnosis of adnexal malignancies and a diagnostic accuracy of 91 to 95 percent in differentiating the benign cases of adnexal masses from the malignancies (12).

In this study, 16 women with age mean of 37.37 and standard deviation of 71.1 years old suffering to adnexal mass were sonography and then, for further investigation under MRI with and without T1 and T2 FAT were placed in the sagittal and axial sections. Pathology results were indicative eight cases of malignant and benign (each 50 percent) and as for MRI results sensitivity, specificity and accuracy were respectively 87.5%, 75%, and 63.5% in the diagnosis of adnexal benign and malignant masses.

In study of Stevens et al. in California, America on 33 patients suffering to adnexal mass that using T1 and T2 sequences were evaluated with and without gadolinium and then MRI imaging results were compared with the laparotomy results; finally, sensitivity 95% and specificity of 94% for detection of adnexal benign and malignant masses was calculated for MRI (26).

One of the difference of mentioned study results with our study can be difference in sample size of two studies. In their study, the proportion of benign cases to malignant was 5.1 but in our study this portion was 1 that can be effective on final outcomes. In study of Yamashita et al which was performed with aim to maximize the MRI detection with and without chamberlain material in determining and identifying benign adnexal masses in patients with adnexal masses which the nature of interstitial mass was reported in sonography;

MRI imaging results with and without the use of chamberlain material 104 patients with adnexal masses after surgery were compared with histopathologic results and to predict the malignant nature of adnexal masses based on MRI results using logistic regression, a model was planned that eventually 87% accuracy showed in the diagnosis of benign and malignant masses and concluded that in those cases that sonography cannot determine the status of adnexal benign and malignant masses; Using MRI with chamberlain material can clear its status of benign and malignant which this conclusion is in line with our study result (27).

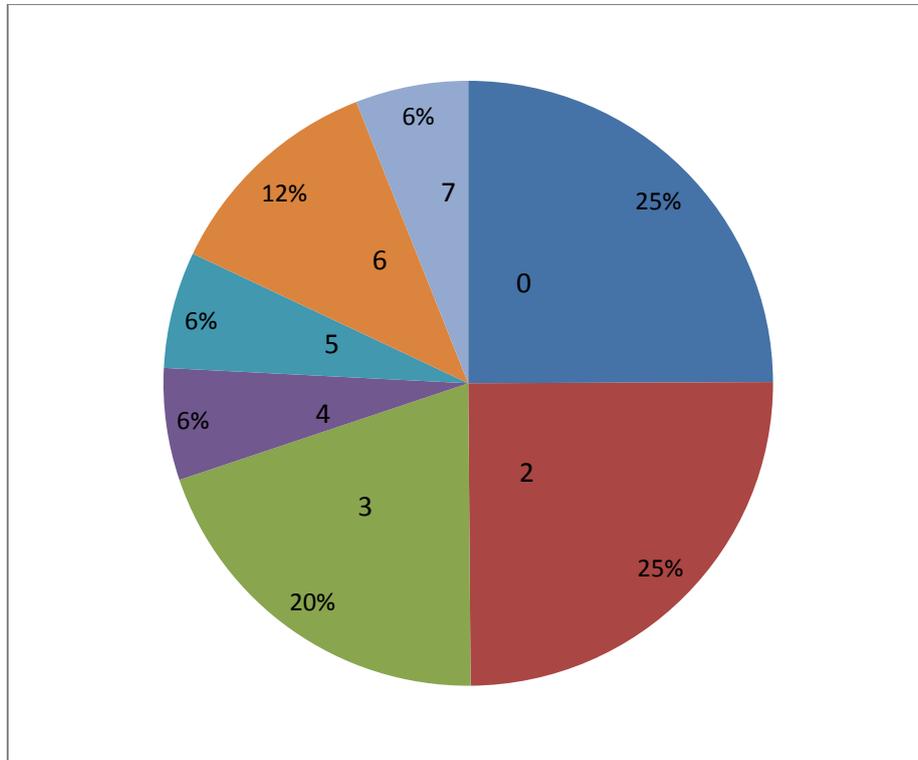
In the Chen et al study to determine the diagnostic value of MRI findings in detecting ovarian malignancies that results of imaging with surgery was compared on 74 patients who were placed under MRI imaging and finally for MRI along with chamberlain material in diagnosis of adnexal malignancies were calculated the sensitivity, specificity and accuracy 86%, 88% and 87% and it is concluded that the use of MRI along with chamberlain material in diagnosis of adnexal complex masses have high accuracy which this result was in line with our study and 10 percent difference between the results of two studies about the feature is because of the differences in samples size this two studies (28).

In the Bazot et al study which was done in order to determine the accuracy of MRI findings in the diagnosis of adnexal masses on 136 women who have inconspicuous adnexal mass in sonography, it was found that the sensitivity and specificity of MRI imaging among 151 adnexal masses compared with the pathology results are respectively 7.89 and 5.84 percent which were almost close to our study findings and observed differences are due to difference in sample sizes of the two studies (29).

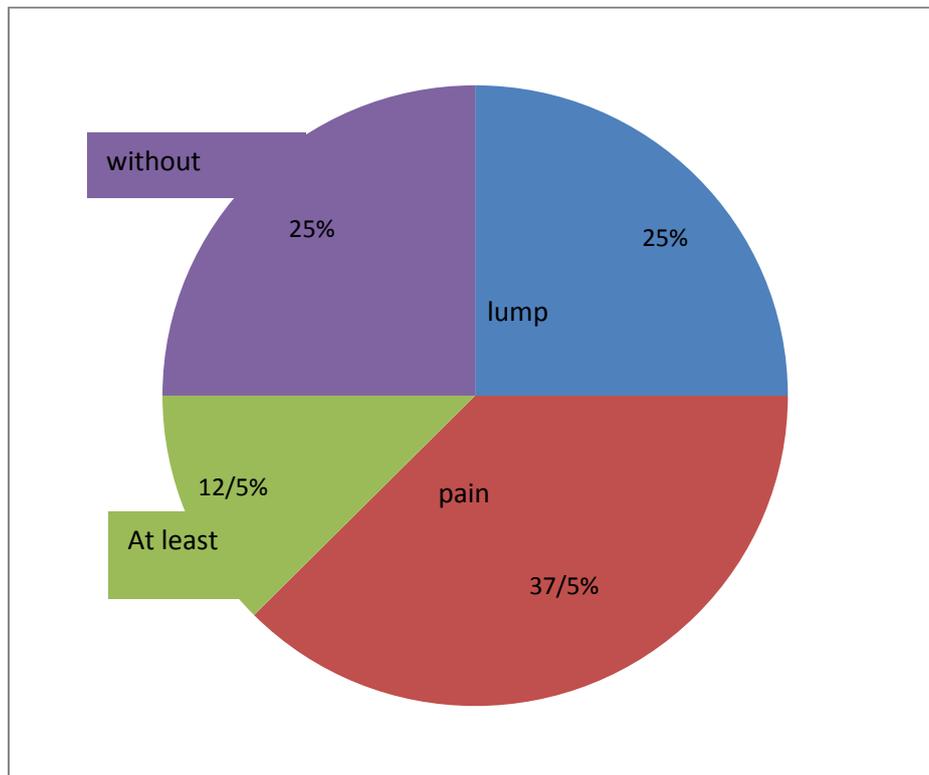
## **Conclusion**

Considering the findings of this study, it can be concluded that sonography can detect adnexal masses in its early stages which is both cheap and available but to get an appropriate diagnosis with pathology and also increasing the sensitivity and accuracy, MRI is a good option with have accuracy of 90% in differentiating of adnexal benign and malignant masses (24).

Our study results also suggest that the sensitivity and specificity and accuracy of MRI was higher in diagnosis of adnexal masses therefore, in cases that sonography presents results of vague and non-specific, use of MRI can help to reach the final diagnosis about adnexal masses nature and segregation of benign from malignant that this issue is also in line with other studies (24).



**Diagram-1. Pregnancy count of referred patients.**



**Diagram-2. Clinical complaints of referred patients.**

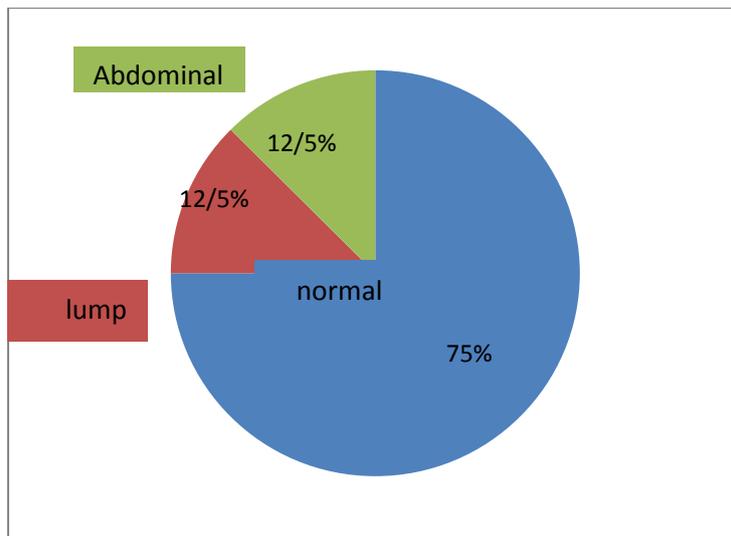


Figure-3. Physical examination findings of patients.

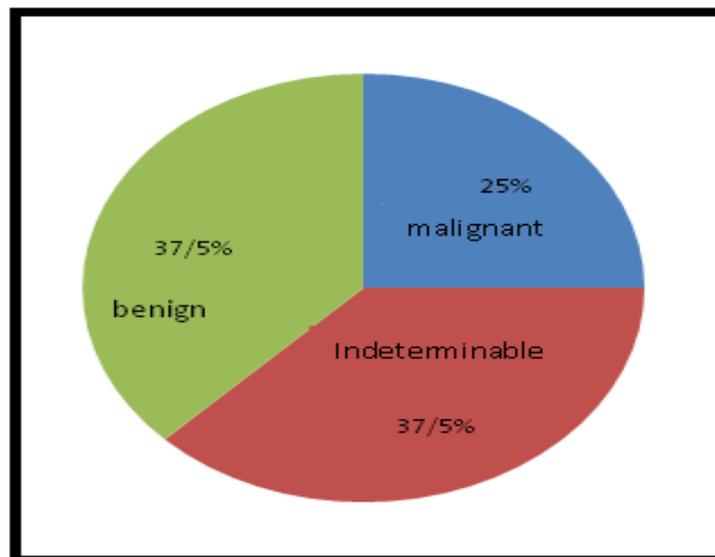


Figure-4. Patients' sonography results.

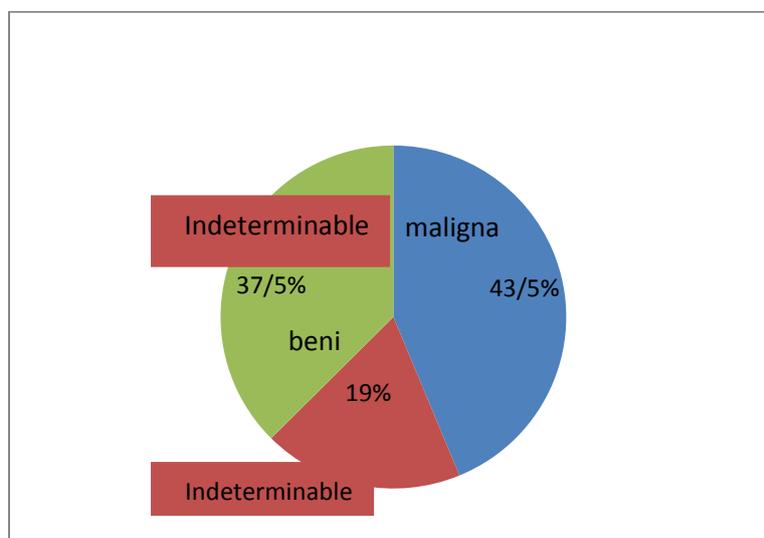


Figure-5. Patients' MRI results.

**Table-1: The sensitivity, specificity and MRI accuracy.**

MRI	percent
Sensitivity	87.5
specificity	75
accuracy	63.5

**Table 2. The Sensitivity and sonography prop.:**

sonography	percent
Sensitivity	37
specificity	63

**References**

1. Curtin JP. Management of the adnexal mass. *Gynecologic oncology*. 1994;55(3):S42-S6.
2. Ekerhovd E, Wienerroith H, Staudach A, Granberg S. Preoperative assessment of unilocular adnexal cysts by transvaginal ultrasonography: a comparison between ultrasonographic morphologic imaging and histopathologic diagnosis. *American journal of obstetrics and gynecology*. 2001;184(2):48-54.
3. Iyer VR, Lee SI. MRI, CT, and PET/CT for ovarian cancer detection and adnexal lesion characterization. *American Journal of Roentgenology*. 2010;194(2):311-21.
4. McDONALD JM, Modesitt SC. The incidental postmenopausal adnexal mass. *Clinical obstetrics and gynecology*.16-506:(3)49;2006 .
5. Feehery K, Benjamin I. NIH Consensus Conference. Ovarian cancer: screening, treatment and follow-up. *JAMA*. 1995;273:491-7.
6. Bristow RE, Duska LR, Lambrou NC, Fishman EK, O'Neill MJ, Trimble EL, et al. A model for predicting surgical outcome in patients with advanced ovarian carcinoma using computed tomography. *Cancer*. 2000;89(7):1532-40.

7. Jeong Y-Y, Outwater EK, Kang HK. Imaging Evaluation of Ovarian Masses 1. *Radiographics*. 2000;20(5):1445-70.
8. Kinkel K, Lu Y, Mehdizade A, Pelte M-F, Hricak H. Indeterminate Ovarian Mass at US: Incremental Value of Second Imaging Test for Characterization—Meta-Analysis and Bayesian Analysis 1. *Radiology*. 2005;236(1):85-94.
9. Timmerman D, Testa AC, Bourne T, Ameye L, Jurkovic D, Van Holsbeke C, et al. Simple ultrasound- based rules for the diagnosis of ovarian cancer. *Ultrasound in obstetrics & gynecology*. 2008;31(6):681-90.
10. Hricak H, Chen M, Coakley FV, Kinkel K, Yu KK, Sica G, et al. Complex Adnexal Masses: Detection and Characterization with MR Imaging—Multivariate Analysis 1. *Radiology*. 2000;214(1):39-46.
11. Sohaib SA, Sahdev A, Trappen PV, Jacobs IJ, Reznick RH. Characterization of adnexal mass lesions on MR imaging. *American Journal of Roentgenology*. 2003;180(5):1297-304.
12. Adusumilli S, Hussain HK, Caoili EM, Weadock WJ, Murray JP, Johnson TD, et al. MRI of sonographically indeterminate adnexal masses. *American Journal of Roentgenology*. 2006;187(3):732-40.
13. Scoutt LM, McCarthy SM, Lange R, Bourque A, Schwartz PE. MR evaluation of clinically suspected adnexal masses. *Journal of computer assisted tomography*. 1994;18(4):609-18.
14. Saini A, Dina R, McIndoe GA, Soutter WP, Gishen P, deSouza NM. Characterization of adnexal masses with MRI. *American Journal of Roentgenology*. 2005;187(3):184-9.
15. Low RN, Carter WD, Saleh F, Sigeti JS. Ovarian cancer: comparison of findings with perfluorocarbon-enhanced MR imaging, In-111-CYT-103 immunoscintigraphy, and CT. *Radiology*. 1995;195(2):391-400.
16. Forstner R, Hricak H, Powell CB, Azizi L, Frankel SB, Stern JL. Ovarian cancer recurrence: value of MR imaging. *Radiology*. 1995;196(3):715-20.
17. Low RN, Saleh F, Thomas Song S, Shiftan TA, Barone RM, Lacey CG, et al. Treated Ovarian Cancer: Comparison of MR Imaging with Serum CA-125 Level and Physical Examination—A Longitudinal Study 1. *Radiology*. 1999;211(2):519-28.
18. Bazot M, Daraï E, Nassar-Slaba J, Lafont C, Thomassin-Naggara I. Value of magnetic resonance imaging for the diagnosis of ovarian tumors: a review. *Journal of computer assisted tomography*. 2008;32(5):712-23.
19. Imaoka I, Wada A, Kaji Y, Hayashi T, Hayashi M, Matsuo M, et al. Developing an MR Imaging Strategy for Diagnosis of Ovarian Masses 1. *Radiographics*. 2006;26(5):1431-48.

20. Chang W-C, Meux MD, Yeh BM, Qayyum A, Joe BN, Chen L-m, et al. CT and MRI of adnexal masses in patients with primary nonovarian malignancy. *American Journal of Roentgenology*. 2006;186(4):1039-45.
21. Stevens S, Hricak H, Stern J. Ovarian lesions: detection and characterization with gadolinium-enhanced MR imaging at 1.5 T. *Radiology*. 1991;181(2):481-8.
22. Yamashita Y, Hatanaka Y, Torashima M, Takahashi M, Miyazaki K, Okamura H. Characterization of Sonographically Indeterminate Ovarian Tumors with MR Imaging A logistic regression analysis. *Acta Radiologica*. 1997;38(4):572-7.
23. Chen M, Wang W, Zhou C, Zhou N, Cai K, Yang Z, et al. Differentiation between malignant and benign ovarian tumors by magnetic resonance imaging. *Chinese medical sciences journal= Chung-kuo i hsueh k'o hsueh tsa chih/Chinese Academy of Medical Sciences*. 2006;21(4):270-5.
24. Bazot M, Nassar-Slaba J, Thomassin-Naggara I, Cortez A, Uzan S, Daraï E. MR imaging compared with intraoperative frozen-section examination for the diagnosis of adnexal tumors; correlation with final histology. *European radiology*. 2006;16(12):2687-99.