

# Risk of malignancy index for adnexal masses

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## Summary

**Objectives:** The aim of this study was to determine the effectiveness of the risk of malignancy index (RMI) and retrospective analysis of patients presenting with adnexal masses to our clinic for treatment. **Methods:** Data of 137 women who had adnexal masses were included in the analysis. A simple algorithm called "risk of malignancy index" (RMI) reported by Jacobs includes menopausal status, ultrasound morphologic features and serum CA125 level. The RMI values were detected for each patient and analyzed to detect the relationship between benign and malign groups of the patients. Statistical analyses were performed with SPSS 15.0 for Windows (SPSS, Inc., Chicago, IL USA). Sensitivity and specificity was calculated for RMI in diagnoses of ovarian cancer by using receiver operating characteristic (ROC) analysis. **Results:** A total of 137 patients with adnexal masses were operated on. Mean age and SD of 137 patients were  $30.64 \pm 10.05$ . Fourteen patients (10.2%) had malignant disease and 123 patients (89.8%) benign pathology. ROC analysis of the RMI showed that the values of area under the curve were significantly high with a value of 0.883 ( $p < 0.001$ ). **Conclusion:** The RMI is a simple scoring system and has a high sensitivity and specificity for the detection of malignant adnexal masses. Application of the RMI in clinical practice may provide a rational basis for specialists to treat patients with adnexal masses before diagnostic surgery.

**Key words:** Adnexal mass; Malignancy index.

## Introduction

Patients with adnexal masses can present a number of different benign and malignant conditions. Preoperative assessment of adnexal tumors remains a major challenge for the gynecologist. Laparotomy is essential to establish the nature of an adnexal mass. The preoperative diagnosis of ovarian cancer is often difficult and inadequate surgical exploration by inexperienced surgeons is a regular occurrence. A sensitive and specific method for a preoperative diagnosis of ovarian cancer would provide a rational basis for referral before diagnostic laparotomy [1]. Serum tumor marker (serum CA125), ultrasound morphologic properties, Doppler ultrasound parameters, and complex statistical methods have been used in the differentiation of adnexal masses [2,3].

An algorithm called "risk of malignancy index" (RMI) introduced by Jacob *et al.* gave a high sensitivity and specificity for the discrimination of adnexal masses [4]. This algorithm is based on the serum CA125 level, menopausal status, and ultrasound morphologic features.

The aim of this study was to retrospectively analyze patients presenting with adnexal masses, to determine the effectiveness of the RMI algorithm, and to examine the sensitivity and specificity of the RMI in identifying patients with ovarian cancer.

## Materials and Methods

Recorded data of the 137 patients who had undergone sonographic evaluation for an adnexal mass between October 2005

and November 2007 were included in the study. Enrolled patients had had surgical removal of the lesion. All non epithelial ovarian cancers were excluded from analysis.

Preoperatively serum biomarker levels were analyzed for CA125 in all patients. (E-170, Roche, USA). Transabdominal or/and transvaginal ultrasound (US) findings and menopausal status were registered. US examination was performed vaginally by using a 7-MHz transducer with Doppler capability and transabdominally with a 3.5 MHz transducer. US features which suggested malignancy were used to obtain the US score and these features included the presence of a solid component, multiloculation, bilaterality, the presence of ascites or the evidence of metastases. An US score of 1 was given if none or one of these features were detected and a score of 3 was given if two or more of these features were detected.

Postmenopausal status was defined as more than one year of amenorrhea or age older than 50 years in women who had had a hysterectomy. Patients who did not meet these criteria were classified as premenopausal.

According to the pre- or postmenopausal status a menopausal score (M) of 1 or 2 was given, respectively.

Based on data obtained from the records the RMI was calculated ( $RMI = U \times M \times \text{serum CA125}$ ) for each patient.

Statistical analyses were performed with SPSS 15.0 for Windows (SPSS, Inc., Chicago, IL USA).

The Mann-Whitney U-test was applied to assess CA125 levels in differentiating benign and malign tumors in patients with adnexal masses.

The t-test was applied to detect the relation between RMI and malignancy among all women with adnexal masses.

Sensitivity and specificity was calculated for RMI in diagnoses of ovarian cancer by using receiver operating characteristics (ROC) analysis.

Pathologic samples were examined by a pathologist and each diagnosis was classified as either benign or malignant.

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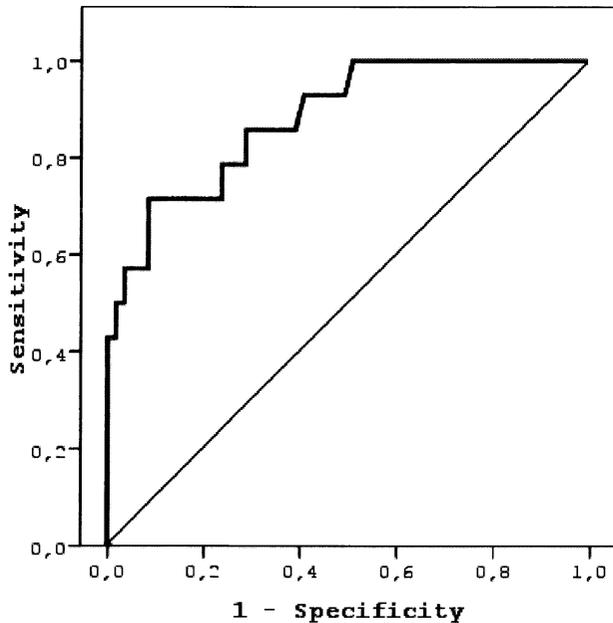


Figure 1. — ROC analysis of the RMI in patients with benign or malign adnexal masses. Area under the curve was significantly high with a value of 0.883 ( $p < 0.001$ ).

## Results

A total of 137 patients with an adnexal mass were operated on. Mean age and SD of 137 patients were  $23.01 \pm 10.40$ . Fourteen of the patients (10.2%) had malignant disease and 123 patients (89.8%) benign pathology.

Median serum CA125 levels in patients with benign and malign adnexal masses were 32.36 U/ml and 56.57 U/ml, respectively (Mann-Whitney U test,  $p < 0.001$ ).

According to the RMI of patients significant differences were observed between the benign and malign conditions. Median values of the RMI in benign and malign conditions were 55.64 and 1113, respectively ( $p < 0.05$ ).

ROC analysis of the RMI is presented in Figure 1. Values of the area under the curve were significantly high with a value of 0.883 ( $p < 0.001$ ) (Figure 1).

## Discussion

Ovarian cancers are a common clinical problem and accounts for 52% of all gynecological cancer deaths [5]. Early detection of an adnexal malignancy is important but the accuracy of diagnostic tests used for evaluation are still of great concern to gynecologists. Preoperative discrimination between benign and malignant adnexal masses for patients is important for optimal management. Due to the limitation of laboratory, clinical and sonographic evaluation gynecologists may not predict ovarian malignancy.

Tumor markers are valuable laboratory findings for evaluating internal malignancies. CA125 levels are elevated in 80% of patients with epithelial ovarian cancer but in only half of patients with early-stage disease [6].

The sensitivity and specificity of CA125 alone for the prediction of ovarian cancer is too low to be of clinical value. Careful attention needs to be paid to false-positives in premenopausal women and low levels of serum CA125 results in patients with early-stage disease or ovarian cancer [7].

Transvaginal sonography has been shown to be an excellent method to characterize adnexal masses [8]. Three/four-dimensional US and contrast-enhanced imaging have been shown to give optimal results to characterize adnexal masses. The benefit of US is the determination of the type of adnexal mass such as solid, cystic, or complex. Solid and complex masses need a thorough evaluation. Sometimes color-flow imaging may distinguish benign and malignant masses. Several benign lesions may present as complex masses. Sonography allows a more detailed assessment of the morphologic features of adnexal masses. Sometimes a benign-appearing adnexal mass on sonography may need further diagnostic tests [9].

The differential diagnosis of adnexal masses in adolescent patients is complex because of functioning ovaries, the onset of sexual activity, and the possibility of pregnancy. The majority of cystic masses in this age group are physiologic cysts related to normal ovarian activity. Ovarian malignancies are uncommon and three-quarters of these are germ cell tumors [10].

The incidence of ovarian cancer increases during postmenopausal period; 30-60% of ovarian masses in women over age 50 are malignant [11]. Thus, an ovarian mass in a postmenopausal woman should be considered malignant until proven otherwise.

The RMI introduced by Jacob *et al.* has given a high sensitivity and specificity for the discrimination of adnexal masses [4]. This algorithm is based on serum CA125 levels, menopausal status, and US morphologic features.

A sensitivity of the RMI of 87.4% in the setting of multiple peripheral referring units appears to compare favorably with the original data published by Jacobs *et al.* [4]. Several other publications have evaluated the performance of the RMI to distinguish malign and benign masses [12,13].

In our study the sensitivity and specificity of the RMI detected 88.3% with ROC analysis. CA125 levels, sonographic features or menopausal status which constitute the RMI in patients with adnexal masses were valuable parameters. The sensitivity and specificity of the RMI in the detection of malignant adnexal masses with ROC analysis were significantly high.

In conclusion, the RMI is a simple scoring system and has a high sensitivity and specificity for the detection of malignant adnexal masses. Application of the RMI in clinical practice may provide a rational basis for specialists treating patients with adnexal masses before diagnostic surgery.

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