RESEARCH ARTICLE

Comparison of Two Ovarian Malignancy Prediction Models Based on Age Sonographic Findings and Serum Ca125 Measurement

Maliheh Arab1*, Mehdi Yaseri2, Tahereh Ashrafganjoi1, Maryam Maktabi3, Giti Noghabae4, Kourosh Sheibani5

Abstract

Objective: The aim of our study is to compare an ovarian malignancy prediction model based on age and four sonographic findings (OMPS1) with a new model called OMPS2 which differs just by adding serum CA125 measurement to (OMPS1). Methods: In a cross sectional comparative study OMPS1 was validated in 830 operated ovarian masses within a 3 years period (2006-2009). Logistic regression analysis was used to construct OMPS2 based on OMPS1 adding serum CA125 findings. The area under the curve for two models was compared in 411 patients. Results: OMPS2 was calculated as follows: OMPS1 + 1.444 (if serum CA125= 36-200) or 3.842 (if serum CA125 is more than 200). AUC of OMPS2 was increased to 84.3% (CI 95% 78.1- 89.8) in comparison to OMPS1 with AUC of 78.1% (CI 95% 71.8-84.5). Conclusion: Our second model is more accurate in prediction of ovarian malignancy, compared with our first model.

Keywords: Logistic model - ovarian mass - ultrasound - serum CA125 - ovarian cancer

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Introduction

Ovarian cancer is in the top list of mortality due to cancer in Europe and the United States (Baker, 1994; Boente, 1999; Oriel, 1999; Holschneider, 2000; Benjapibal, 2007). Tumors of the ovary generally present as adnexal masses (Campos et al., 2002). Proper management of an adnexal mass depends greatly on predicting the chance of malignancy to decide correctly by whom and where the patient should be operated on (Marjunath, 2001; Mederiros, 2005). In the case of malignancy the best prognosis is achieved if the patient is referred to tertiary care hospitals and primary operations done by expert surgeons in Gyneco – oncology field (Benedet, 2000; Soegaard, 2003; Valentin, 2004; Vernooij, 2007).

There are many different parameters and models to predict the risk of malignancy in ovarian masses. Sonographic features and serum CA125 are two main predictors which are widely studied regarding their Sensitivity and specificity as ovarian malignancy predictors (Depriest, 1999; Kinkel, 2000; Benjapibal, 2003; Szpurek, 2005; Javitt, 2007).

In a previous study sonography by an expert was superior to CA125 for the prediction of malignancy and there was no improvement by adding CA125 to sonographic findings in prediction of malignancy (Valentin, 1999).

We have previously constructed an Ovarian Malignancy Prediction Scoring model (OMPS) based on age and 4 sonographic findings including size, solid area, ascitis and bilateralism to predict malignancy and presented it as a simple and accurate clinical tool for ovarian malignancy prediction (Arab, 2010). The OMPS model was constructed based on 3303 adnexal mass surgeries in Tehran, 2000-2006. With the score number of 3.65 as cutoff value of malignancy prediction by OMPS1, the sensitivity of 77.9% and specificity of 72.9% was achieved with ROC curve AUC of 83.95%. Other models have been constructed by other researchers with different predicting accuracy namely Risk of Malignancy Index (RMI) number 1-5 based on sonographic findings, menopausal status and CA125 level (Soegaard, 2003; Obeidat, 2004; Leelahakorn, 2005; Ulusoy, 2007; Moolthiya, 2009).

In the present study, our previous Ovarian Malignancy Prediction Scoring model (OMPS1) based on age and four sonographic findings was validated and compared with a new constructed method of prediction called OMPS2, which differs just in having the serum CA125 value as an additional parameter.

1Gynecology-Oncology, 2Obstetrics and Gynecology, 3General physician, 4Clinical Research and Development Center, Imam Hossein Medical Center, Shahid Beheshti University of Medical Sciences, 5School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences, Tehran, Iran *For correspondence: drmarab@yahoo.com
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Materials and Methods

In a cross sectional analytical study, pathologic reports of operated adnexal masses in 8 secondary and tertiary care hospitals in Tehran (7 centers) and Hamadan (one Center) were reviewed from 2006-2009. Cases operated on due to other indications such as bleeding, fibroma or other causes were excluded and the ovarian masses, with size of less than 3 centimeters before surgery, were excluded as well. Finally 830 operated adnexal masses were included in our study.

In every ovarian Malignancy Probability Score (OMPS1) was calculated based on age and sonographic findings using the following formula:

\[
\text{Age} \times 0.062 + \text{tumor size (cm)} \times 0.012 + 1.172\text{ (if the tumor is bilateral)} + 1.289\text{ (if ascites is present)} + 0.758\text{ (if the tumor is solid)} + 0.25\text{ (if bilaterality)}
\]

Table 1. Comparison of age and Sonographic Findings of Malignant and Benign Tumors in 830 Patients

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Malignant</th>
<th>Benign</th>
<th>Difference</th>
<th>CI 95%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>46.1±15 (^1)</td>
<td>37.8±14 (^1)</td>
<td>8.4</td>
<td>4.3-12.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Size (cm)</td>
<td>12±6.7 (^1)</td>
<td>8.2±3.9 (^1)</td>
<td>3.8</td>
<td>1.9-5.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Solid pattern</td>
<td>36(66.7) (^1)</td>
<td>91(25.5) (^1)</td>
<td>41.2</td>
<td>27.8-54.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ascitis</td>
<td>13(24.1) (^1)</td>
<td>32 (9) (^1)</td>
<td>15.1</td>
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<tr>
<td>Bilateral</td>
<td>16(29.6) (^1)</td>
<td>52(14.6) (^1)</td>
<td>15.1</td>
<td>2.3-27.8</td>
<td>0.005</td>
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<tr>
<td>CA125 &lt;35</td>
<td>14(25.9) (^1)</td>
<td>267(74.1) (^1)</td>
<td>46.9</td>
<td>-61.4-36.3</td>
<td>&lt;0.001</td>
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<td>CA125:36-200</td>
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<td>81(22.7) (^1)</td>
<td>10.6</td>
<td>2.6-18.6</td>
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<td>CA125:200</td>
<td>22(40.7) (^1)</td>
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<td>38.5</td>
<td>25.0-51.4</td>
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Figure 1 compares AUC of ROC Curves of OMPS1 and OMPS2 in Malignancy Prediction of Adnexal Masses.

Table 2. Comparison of Age, Sonographic Findings and Serum CA125 of Malignant and Benign Tumors in 411 Patients

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Discussion

In a meta-analysis including 5159 cases in 46 studies, ROC curve of combined methods was more accurate in comparison to a single method such as sonography or serum CA125 alone (Kurjak, 1992; Caruso, 1996; Rufford, 2003). Sonography alone is highly sensitive in detection of ovarian mass malignancy, but its specificity is relatively low (Valentin, 2001; Diamandis, 2003; Valentin, 2004; Szpurek, 2005; Enakpene, 2009). In the other hand,
serum CA125 measurement is a specific test in prediction of ovarian malignancy (Edgell, 2010).

The present study revealed that OMPS1 model is valid in our 830 patients group with sensitivity of 68.5% and specificity of 75.6% in prediction of ovarian malignancy.

We found that in the cutoff point of 2.3 or above, our OMPS1 model of prediction has a sensitivity of 100% (Arab, 2010) so it has good value as a first screening protocol.

In 411 patients group the accuracy of malignancy prediction by OMPS2 increased from 78.1%95% CI : 71.8-84.5% for OMPS1 to 84.3% 95% CI :78.1-89.9% for OMPS2. Considering the results of multiple logistic regression analysis (Table 2), adding CA125 to OMPS1 (sonographic findings) significantly increases the accuracy of malignancy prediction (P<0.001).

These findings of our study might confirm the role of sonography as a sensitive and serum CA125 measurement as a specific test. OMPS1 is mostly based on sonography and OMPS2 just add serum CA125 measurement to OMPS1. SO, OMPS1 could be regarded a sensitive and OMPS2 a specific model.

If we are in a position to choose between a secondary or tertiary care hospitals to refer the patient a prediction model with high sensitivity is needed. So, a very low score of OMPS1 (below 2.3) might rule out malignancy as a sensitive tool, while numbers above this for OMPS2 can guide to more specifically determined probability of malignancy.

In malignant cases, optimal surgical debulking and appropriate staging are the key points of improving survival (Trim, 2003; Winter, 2007). These optimal results are achieved mostly in tertiary care hospitals (Mederiros, 2005). OMPS1 might be used in the first step of triage and with very low scores (below 2.3), malignancy is ruled out with 100% sensitivity and there is no need to pay attention to CA125 results or requesting this test and if OMPS1 is more than 2.3, patient can be reevaluated using OMPS2 at second step.

Another reason to propose this two step approach is the high levels of CA125 in some benign ovarian masses such as endometrioma and tuberculosis, which might mislead the practitioner to malignancy if CA125 is used in the first step (Campos et al., 2002; Moolthiaya, 2009).

In conclusion OMPS2 in comparison to OMPS1 was more accurate and specific in prediction of malignancy especially in high score OMPS1 patients.

References


