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**Title:** A New Scoring System for Diagnosis of Epithelial Ovarian Cancer in Patients with a Pelvic Mass

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A NEW SCORING SYSTEM FOR DIAGNOSIS OF EPITHELIAL OVARIAN CANCER IN PATIENTS WITH A PELVIC MASS

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ABSTRACT

**Background**: Epithelial ovarian cancer is the second most common of gynecologic cancer and the leading cause of gynecologic cancer-related death. In 2008, 225,000 new cases were diagnosed and 140,000 women died of the disease worldwide ([1](#_ENREF_1)). The utmost important for long-term survival in women with epithelial ovarian cancer is optimal debulking surgery ([2-4](#_ENREF_2)). In addition, the surgical outcome is superior if patients are operated on by gynecologic oncologists. Therefore, pre-surgical discrimination of benign diseases and epithelial ovarian cancer plays a critical role in ovarian cancer management and survival.

**Objective**: To develop a new scoring system using menopausal status, ultrasound findings, serum level of CA125 and HE4 to diagnosis of epithelial ovarian cancer in patients presenting with a pelvic or ovarian mass/tumor.

**Design**: Prospective cohort study

**Setting**: Five diagnostic tests – Risk of Malignant Index (RMI), CA 125, HE 4, Risk of Ovarian Malignancy Algorithm (ROMA) and Sassone ultrasound score – were prospectively applied to women over 18 years old clinically diagnosed pelvic or ovarian masses/tumors undergoing elective surgery at Rajavithi Hospital between January 2012 and December 2012. A new scoring system that took into account the menopausal status, ultrasound morphologic pattern, the serum CA125 and HE4 levels was developed and applied to the validating sample, which was composed of women over 18 years old clinically diagnosed pelvic or ovarian masses/tumors undergoing elective surgery at Rajavithi Hospital between January 2013 and June 2013.

**Main outcome measures**: Multiple logistic regression analysis was used to investigate the predictive factors for discrimination between benign diseases and epithelial ovarian cancer and proposed the new scoring system. The performance of all diagnostic tests was analyzed from sensitivity, specificity and area under the Receiver Operating Characteristic (ROC) curve. The optimal cutoff value was calculated by Yoden Index method.

**Results**: In the developing sample, a total of 260 women was evaluated, of which 158 had benign diseases, 66 had epithelial ovarian cancer (EOC), 28 had borderline tumors and 8 had other malignant diseases. The performance of RMI, CA125, HE4, ROMA and Sassone ultrasound score that was evaluated by using areas under the ROC curves showed 88.7%, 82.3%, 84.9%, 89.1% and 77.3%, respectively. The following scoring system was developed: P = \*. This system was well calibrated (goodness-of-fit test, p = \*) and well discriminated (area under the ROC curve = \*, 95%CI:\* to \*). The performance in the validating sample of \* women was well discriminated with an area under the ROC curve of \* (95% CI:\* to \*). When a cut-off value of P > \* was used to predict the diagnosis of epithelial ovarian cancer in the validating sample, this system had a sensitivity, specificity, positive and negative predictive values of \*%, \*%, \*% and \*%, respectively.

**Conclusions**: The new scoring system of combined menopausal status, menopausal status, ultrasound findings, serum level of CA125 and HE4 showed good performance in distinction between benign disease and epithelial ovarian cancer. However, a larger prospective study is required to confirm these preliminary data.

**Key words:** pelvic mass, epithelial ovarian cancer, Risk of Malignant Index, CA 125, HE 4, Risk of Ovarian Malignancy Algorithm, Sassone ultrasound score

REFERENCES

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer. 2010;127:2893-917.

2. Le T, Adolph A, Krepart GV, Lotocki R, Heywood MS. The benefits of comprehensive surgical staging in the management of early-stage epithelial ovarian carcinoma. Gynecol Oncol. 2002;85:351-5.

3. Trimbos JB, Vergote I, Bolis G, Vermorken JB, Mangioni C, Madronal C, et al. Impact of adjuvant chemotherapy and surgical staging in early-stage ovarian carcinoma: European Organisation for Research and Treatment of Cancer-Adjuvant ChemoTherapy in Ovarian Neoplasm trial. J Natl Cancer Inst. 2003;95:113-25.

4. du Bois A, Reuss A, Pujade-Lauraine E, Harter P, Ray-Coquard I, Pfisterer J. Role of surgical outcome as prognostic factor in advanced epithelial ovarian cancer: a combined exploratory analysis of 3 prospectively randomized phase 3 multicenter trials: by the Arbeitsgemeinschaft Gynaekologische Onkologie Studiengruppe Ovarialkarzinom (AGO-OVAR) and the Groupe d'Investigateurs Nationaux Pour les Etudes des Cancers de l'Ovaire (GINECO). Cancer. 2009;115:1234-44.