Ovarian Cancer Markers

Indications for Ordering
Adjunct tests for evaluation of an ovarian mass

Test Description
Cancer Antigen 125 (CA 125)
- Quantitative electrochemiluminescent immunoassay
Human Epididymis Protein 4 (HE4)
- Quantitative enzyme immunoassay
Risk of Ovarian Malignancy Algorithm (ROMA)
- Quantitative enzyme immunoassay
- Quantitative electrochemiluminescent immunoassay

Tests to Consider
Primary tests
Cancer Antigen 125 0080462
- Evaluate and monitor ovarian cancer (usually epithelial subtype)
  - Monitoring requires elevated pretreatment value of CA 125
  - Combination with HE4 may enhance sensitivity
- Not recommended for monitoring breast cancer or germ cell tumors
- Not a stand-alone test for ovarian cancer screening or diagnosis

Human Epididymis Protein 4 (HE4) 2003020
- Use with CA 125 to monitor ovarian cancer, usually epithelial subtype, post therapy if pretreatment level was elevated
- Not recommended for monitoring mucinous or germ cell ovarian cancer
- Not a stand-alone test for ovarian cancer screening or diagnosis

Risk of Ovarian Malignancy Algorithm 2012618
- Assess cancer risk, particularly epithelial cell ovarian cancer, in pre- and postmenopausal women with an adnexal mass
- Combines CA 125 and HE4, together with menopausal status, to classify adnexal mass patients into high- or low-risk epithelial ovarian cancer groups
- Not intended as a screening, stand-alone, or tumor-monitoring test
- Tumor monitoring using HE4 and/or CA 125 test should be ordered separately

Related tests
Granulosa cell tumors
- Inhibin B 0070413
- Total Inhibin, Serum 2014109
- Estradiol, Adult Premenopausal Female, Serum or Plasma 0070045

Germ cell tumors
- Alpha Fetoprotein, Serum (Tumor Marker) 0080428
- Neuron Specific Enolase 0098198
- Beta-hCG, Quantitative (Tumor Marker) 0070029

Disease Overview
Incidence
- Ovarian cancer – >22,000 new cases and >14,000 deaths annually
  - Epithelial subtype – 40/100,000 for postmenopausal women

Diagnosis
- Markers cannot be used to diagnose ovarian cancer
- Markers may be useful in evaluation of a pelvic mass in postmenopausal women

Prognosis
- Pretreatment CA 125 and HE4 levels are highly predictive of overall survival

Pathophysiology
- CA 125
  - Secreted in tumors of epithelial origin (~80% of tumors)
  - Frequency of elevation of CA 125 correlates with
    - Clinically detected stage of cancer (higher elevation of CA 125 levels in later stages)
    - Tumor burden (correlates with stage)
    - Type of tumor (usually in epithelial tumors)
- HE4
  - Secreted in tumors of epithelial origin (~80% of tumors)
  - Relapse
    - HE4 increases by ≥25% in 60% of women with ovarian cancer relapse or progression
    - HE4 remains constant in 75% of women without progression of ovarian cancer
Monitoring

- **CA 125**
  - **Uses**
    - Evaluate ovarian mass
    - Determine pretreatment level for use in monitoring
    - Assess patient response to chemotherapy
    - Detect early relapse
  - **Suggested monitoring** is every 2-4 months for the first 2 years
  - **Absolute serum value of CA 125** before third cycle of chemotherapy is most important factor for predicting progression at 12 months
  - Persistent postoperative elevation suggests poor prognosis
  - **HE4**
    - May be complementary for monitoring when used in conjunction with CA 125
    - May be useful because some individuals do not have elevated CA 125 level but will manifest with elevated HE4 level

Test Interpretation

**Results**

- **CA 125**
  - **Normal** – <35 U/mL
    - Ovarian cancer less likely but not ruled out
    - In patients with ovarian cancer, a rising level compared to baseline level may reflect disease progression
  - **Abnormal** – ≥35 U/mL
    - Ovarian cancer possible if clinical suspicion is high
    - The higher the level, the greater probability of malignancy
- **HE4**
  - **Normal** – ≤150 pmol/L
    - HE4 remains constant in 75% of women without disease progression
    - An elevation in HE4 concentration of ≥25% is clinically significant even if within the normal range
    - An increase of this magnitude suggests recurrence or disease progression
  - **Abnormal** – ≥151 pmol/L
    - An increase of ≥25% suggests recurrence or disease progression
    - HE4 increases by ≥25% in 60% of women with ovarian cancer relapse or progression
    - The higher the level, the greater the probability of malignancy
    - A decrease of ≥25% suggests therapeutic response

- **ROMA**
  - **Premenopausal**
    - >1.30 – high likelihood of finding epithelial ovarian cancer
    - ≤1.30 – low likelihood of finding epithelial ovarian cancer
  - **Postmenopausal**
    - >2.76 – high likelihood of finding epithelial ovarian cancer
    - ≤2.76 – low likelihood of finding epithelial ovarian cancer

**Limitations**

- CA 125 and HE4 tests are not useful in cancer screening
- Individuals with confirmed ovarian carcinoma may have pretreatment CA 125 values in the same range as healthy individuals
- CA 125 levels may be elevated in patients with nonmalignant disease
- Test values for CA 125 are not interchangeable between different laboratories or test platforms
  - Sequential monitoring should be performed at the same laboratory
- ROMA should not be used without an independent clinical/radiological evaluation and is not intended to be a screening test or to determine whether a patient should proceed to surgery