Are Serum Protein Biomarkers Effective in Detecting Ovarian Cancer in Its Early Stages?

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September is National Ovarian Cancer Month (American Cancer Society, 2009). Ovarian cancer accounts for the highest number of gynecologic deaths and the fifth highest number of cancer deaths in American women (Jemal et al., 2008). Approximately 21,550 women living in the United States will be diagnosed with cancer of the ovaries in 2009 (Horner et al., 2009). The Surveillance, Epidemiology, and End Results cancer database shows that the five-year relative survival rate for ovarian cancer is approximately 45.9% (Horner et al.). Regarding stage distribution for all cases of ovarian cancer, metastatic disease is diagnosed in about 62% of cases, whereas localized and regional disease is diagnosed in 15% and 17% of cases, respectively (Horner et al.).

Because early-stage ovarian cancer presents with nonspecific symptoms, diagnosis most often is made after the malignancy has spread beyond the ovaries (O'Rourke & Mahon, 2003). Mortality rates for this type of malignancy are high because of a lack of an early-stage screening method (Visintin et al., 2008). The 10-year survival rate for localized ovarian cancer is approximately 90%. It drops significantly to about 60% for regional disease and about 20% for metastatic disease. This is the basis for continued research efforts to obtain high-quality screening techniques for early detection of ovarian cancer (Chambers & Vanderhyden, 2006).

Because of a low prevalence of ovarian cancer in U.S. women, an ovarian cancer diagnostic or screening test must have a minimum of 99.6% specificity before it can be used routinely in the general population of postmenopausal women (Jacobs & Menon, 2004). Such a test may offset potential morbidity and mortality, which can be associated with complications of surgery for patients who have false-positive ovarian cancer screening tests (Jacobs & Menon). See Figure 1 regarding clinical uses of a diagnostic tool. An ovarian cancer screening test also should have high sensitivity (i.e., positive test in women with the disease) and a suitable positive predictive value (PPV) (O'Rourke & Mahon, 2003). PPV is the likelihood that a person has a particular disease when he or she has a positive test result for that disease. Negative predictive value (NPV) is the likelihood that a person does not have a particular disease when he or she has a negative test result for that disease (Visintin et al., 2008).

Current Screening Methods

Routine screening for ovarian cancer in the general population is not recommended (U.S. Preventive Services Task Force, 2005) because traditional screening methods are not sensitive and specific enough (Nossov et al., 2008). The workup for women who have signs and symptoms suggestive of ovarian cancer may include abdominal and pelvic examination, ultrasound, abdominal and pelvic computed tomography, cancer antigen 125 (CA-125) testing, laparotomy (National Comprehensive Cancer Network, 2008), and laparoscopy. Signs and symptoms are as follows (National Comprehensive Cancer Network).

- Suspicious pelvic mass palpable on physical examination
- Ascites and abdominal distention
- Symptoms (e.g., bloating, abdominal or pelvic pain, eating difficulty, feeling full quickly after eating, urinary symptoms such as urgency or frequency) not indicative of another malignancy

Women who are at high risk for developing ovarian cancer (i.e., family history of ovarian or breast cancer or health history of breast cancer) sometimes undergo transvaginal ultrasound (Jacobs & Menon, 2004).

- Determines future risk of a disease
- Screens for and/or confirms presence of a disease
- Determines staging and/or prognosis of a disease
- Monitors and/or optimizes treatment outcomes for a disease

Figure 1. Clinical Uses of a Diagnostic Tool

Note. Based on information from Gutman & Kessler, 2006.

Proteomics

Proteomics is the complex study of the human proteome, which consists of a dynamic wide range of individual proteins. Proteomic technology has the potential to help develop diagnostic tools for the detection of cancer. Since the turn of the century, a number of techniques have emerged for identifying and characterizing proteins (Jacobs & Menon, 2004). The technologies are advantageous because

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