Ovary

Patricia Hartge, Sc.D.*

The ovaries are a pair of almond-shaped glands that lie on each side of the uterus. They store egg cells and secrete the hormones that regulate pregnancy and menstruation. While cancers can occur in any of the multiple types of ovarian cells (Scully 1987), they typically arise in the layer of epithelial cells that surround the ovary. Left and right ovaries are affected about equally, and both are involved at the time of diagnosis in one-third of cases (Johannes, 1992).

In 1994, there were an estimated 24,000 new cases and 13,600 deaths from ovarian cancer in the United States (Boring et al., 1994). Since 1973, incidence has increased slightly while mortality has declined. The 1987–91 age-adjusted incidence was 14.8 cases per 100,000 women; the incidence increases with age until age 75 when rates decline (Ries et al., 1994). Five years after a diagnosis of ovarian cancer, survival is approximately 42 percent (Ries et al., 1994).

Scandinavian countries were among those reporting the highest ovarian cancer incidence rates in the world, with world standardized rates over 14/100,000 (Parkin et al., 1992). Comparable rates for U.S. white and black women, respectively, are 13 and 7 per 100,000 (Ries et al., 1994). Risk is also three to five times greater among women whose mothers or sisters have developed ovarian cancer (Amos et al., 1993) and, among women with a history of breast cancer, there is an estimated excess risk of 70 percent (Harvey and Brinton, 1985).

Several reproductive and menstrual factors affect the risk of developing ovarian cancer (Booth and Beral, 1985; Parazzini et al., 1991), the strongest being the number of full-term pregnancies (Whittemore et al., 1992a, 1992b). Women who have had three or four pregnancies have about half the risk of women who have had none; the average reduction in risk appears to be 13 to 19 percent per pregnancy. The number of incomplete pregnancies and the time spent breast-feeding are also associated with progressively decreasing risk, but are not as beneficial as term pregnancies. The time spent taking oral contraceptives strongly relates to risk, with a 5 to 10 percent additional reduction in risk for each year. The combined effect of family history, parity, and oral contraceptive use produce a 15-fold gradient in risk (Hartge et al., 1994). Women who have had difficulty getting pregnant are at increased risk, even after the other risk factors are taken into account.

Tubal ligation and hysterectomy clearly are associated with reduced risk, but the explanation remains uncertain (Weiss and Harlow, 1986). Use of talcum powder on the perineal area appears to be associated with risk, but accounts for few cases and there may not be a causal relationship (Harlow et al., 1992).

* From the Environmental Epidemiology Branch, Division of Cancer Etiology, National Cancer Institute, Bethesda, Maryland

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Several studies have found dietary fat to be associated with a slight increase in risk (Parazzini et al., 1991). One new dietary hypothesis proposes that, in people with a slower-than-normal galactose to glucose conversion time, a diet high in lactose poses an increased risk (Cramer et al., 1989). However, this theory has not been confirmed in subsequent studies (Herrington et al., 1995).

Reproductive and menstrual characteristics that apparently have little or no effect on risk include: age at first birth, age at menarche, age at menopause, and estrogen replacement therapy. Alcohol, coffee, and tobacco appear not to affect risk either (Hartge et al., 1989; Parazzini et al., 1991).

Epithelial tumors of low malignant potential have a different clinical appearance and course from invasive cancers, but their epidemiology appears to be quite similar (Harris et al., 1992; McGowan et al., 1988). Nonepithelial tumors show markedly different epidemiology; parity and oral contraceptive use may be associated with increased risk (Whittemore et al., 1992b).

REFERENCES

Amos CI and Struewing JP: Genetic epidemiology of epithelial ovarian cancer. *Cancer* 71 (2 suppl):566-572, 1993.

Booth M and Beral V: The epidemiology of ovarian cancer. In Ovarian Cancer (Hudson CN, ed.). Oxford: Oxford University Press, 1985.

Boring CC, Squires TS and Tong T: Cancer Statistics 1994. *CA Cancer J Clin* 44:7-26, 1994.

Cramer DW, Harlow BL, Willett WC, et al.: Galactose consumption and metabolism in relation to the risk of ovarian cancer. *Lancet* ii:66-71; 1989.

Harlow BL, Cramer DW, Bell DA, et al.: Perineal exposure to talc and ovarian cancer risk. *Obstet Gynecol* 80(1):19-26, 1992.

Hartge P, Whittemore AS, Intyre J and the Collaborative Ovarian Cancer Group. Rates and risks of ovarian cancer in subgroups of white women in the United States. *Obstet Gynecol* 84:760-764, 1994.

Harris R, Whittemore AS, Itnyre J, and the Collaborative Ovarian Cancer Group: Characteristics relating to ovarian cancer risk: Collaborative analysis of twelve U.S. case-control studies. III. Epithelial tumors of low malignant potential in white women. *Am J Epidemiol* 136(10):1204-11, 1992.

Hartge P, Schiffman MH, Hoover R, et al.: A case-control study of epithelial ovarian cancer. *Am J Obstet Gynecol* 161:10-16, 1989.

Harvey EB and Brinton LA: Second cancer following cancer of the breast in Connecticut, 1935-82. *J Natl Cancer Inst Monogr* 68:99-112, 1985.

Johannes CB, Kaufman DW, Rosenberg L, et al.: Site of origin of epithelial ovarian cancer. *BMJ* 304(6818): 27-28, 1992.

McGowan L, Norris HJ, Hartge P, et al.: Risk factors in ovarian cancer. *Eur J Gynaecol Oncol* 9:195-199, 1988.

Parkin DM, Muir CS, Whelan S, et al. (eds.): Cancer Incidence in Five Continents, vol VI. IARC Scientific Publication No. 120. World Health Organization, International Agency for Research on Cancer, Lyon, 1992.

Parazzini F, Franceschi S, La Vecchia C, et al.: The epidemiology of ovarian cancer. *Gynecol Oncol* 43:9-23, 1991.

Ries LAG, Miller BA, Hankey BF, et al.: SEER Cancer Statistics Review, 1973-1991: Tables and Graphs, National Cancer Institute. NIH Publ. No. 94-2789, Bethesda, MD, 1994.

Scully RE: Classification of human ovarian tumors. *Environ Health Perspect* 73:15-24, 1987.

Stanford JL: Oral contraceptives and neoplasia of the ovary. *Contraception* 43:543-556, 1991.

Weiss NS and Harlow BL: Why does hysterectomy without bilateral oophorectomy influence the subsequent incidence of ovarian cancer? *Am J Epidemiol* 124:856-858, 1986.

Whittemore AS, Harris R, Itnyre J, and the Collaborative Ovarian Cancer Group: Characteristics relating to ovarian cancer risk: Collaborative analysis of twelve U.S. case-control studies. II. Invasive epithelial cancers in white women. *Am J Epidemiol* 136(10):1184-203, 1992a.

Whittemore AS, Harris R, Itnyre J, and the Collaborative Ovarian Cancer Group: Characteristics relating to ovarian cancer risk: Collaborative analysis of twelve U.S. case-control studies. IV. The pathogenesis of epithelial ovarian cancer. *Am J Epidemiol* 136(10):1212-20, 1992b.