Gynecologic Oncology Reports 13 (2015) 13–17

Contents lists available at ScienceDirect

Gynecologic Oncology Reports

journal homepage: www.elsevier.com/locate/gore

Case Series

Menopausal hormone therapy and mortality among women diagnosed with ovarian cancer in the NIH-AARP Diet and Health Study

Ashley S. Felix [a,b,*], Kristen Bunch [c], Hannah P. Yang [a], Hannah Arem [d], Britton Trabert [a], Gretchen L. Gierach [a], Yikyung Park [d,1], William J. Lowery [c], Louise A. Brinton [a]

[a] Hormonal and Reproductive Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 9609 Medical Center Drive, Bethesda, MD 20892-9774, United States
[b] Cancer Prevention Fellowship Program, Division of Cancer Prevention, National Cancer Institute, 9609 Medical Center Drive, Bethesda, MD 20892-9774, United States
[c] Gynecologic Oncology Division, Department of Obstetrics and Gynecology, Walter Reed National Military Medical Center, Bethesda, MD 20889-5600, United States
[d] Nutritional Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 9609 Medical Center Drive, Bethesda, MD 20892-9774, United States

ARTICLE INFO

Article history:
Received 2 March 2015
Accepted 28 April 2015
Available online 9 May 2015

Keywords:
Estrogen plus progestin
Ovarian cancer
Mortality
Menopausal hormone therapy

ABSTRACT

Background: Although menopausal hormone therapy (MHT) use has been linked with an increased risk of ovarian cancer, whether pre-diagnosis MHT use affects ovarian cancer-specific mortality is unknown.
Methods: Our analysis included 395 incident epithelial ovarian cancer patients with data on pre-diagnosis MHT use from the National Institutes of Health-AARP (NIH-AARP) Diet and Health Study. We used Cox proportional hazards regression models to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for MHT type and ovarian cancer-specific mortality, adjusted for tumor characteristics, treatment, and other risk factors. Effect modification by histology (serous vs. non-serous) was examined using likelihood ratio tests comparing models with and without interaction terms between MHT type and histology.
Results: Ovarian cancer-specific mortality was not associated with pre-diagnosis estrogen-only therapy (ET) (HR = 1.09, 95% CI = 0.70–1.68) or estrogen plus progestin-only therapy (EPT) (HR = 0.97, 95% CI = 0.68–1.38). Neither recency of use nor specific regimen of EPT-only (sequential vs. continuous) was related to mortality. In analyses stratified by histology, no significant association between MHT type and ovarian cancer-specific mortality was observed among serous or non-serous cases; however, a significant interaction between MHT type and histology was noted (p-heterogeneity = 0.01).
Conclusion: Our results suggest that pre-diagnosis MHT use is not related to risk of ovarian cancer-specific death.

1. Introduction

Following publication of unfavorable results from the Women's Health Initiative (WHI) trial, including an increased risk of breast cancer associated with estrogen plus progestin therapy (EPT) (Rossouw et al., 2002), prescription of all forms of menopausal hormone therapy (MHT) in the U.S. rapidly declined (Ettinger et al., 2012). Data from the North American Association of Central Cancer Registries showed an accelerated decline in ovarian cancer incidence after the year 2002, subsequent to the publication of the WHI results (Yang et al., 2013). Ovarian cancer risk may be driven by hormone-related factors (Hunn and Rodriguez, 2012) and the presence of hormone receptors in ovarian cancer tissues suggests this malignancy is hormonally-responsive (Rao and Slotman, 1991). In a meta-analysis from the Collaborative Group on Epidemiological Studies of Ovarian Cancer, both estrogen-only therapy (ET) and EPT increased risk of ovarian cancer overall and for the two most common histology subtypes, serous and endometrioid (Collborative Group on Epidemiological Studies of Ovarian Cancer, 2015). However, whether use of MHT prior to diagnosis affects subsequent mortality among ovarian cancer patients has not been well-described. Therefore, we examined this relationship in the National Institutes of Health-AARP (NIH-AARP) Diet and Health Study. We further evaluated whether the association between MHT and mortality differed by hormone type (ET versus EPT) or histology (serous versus non-serous).

2. Materials and methods

2.1. Study population

The NIH-AARP Diet and Health Study has been previously described (Schatzkin et al., 2001). Briefly, the NIH-AARP cohort included 566,398 AARP members (aged 50–71 years) who completed a mailed baseline questionnaire in 1995–1996. An additional questionnaire was sent out (1996–1997) with more detailed questions on MHT use. Of the

* Corresponding author at: 9609 Medical Center Drive, Room 7E214, Bethesda, MD 20892-9774, United States. Fax: +1 240 276 7838.
E-mail address: ashley.felix@nih.gov (A.S. Felix).
[1] Current affiliation: Division of Public Health Sciences, Washington University School of Medicine, St. Louis, MO 63110, United States.

http://dx.doi.org/10.1016/j.gore.2015.04.007

128,002 women who completed the 1996–1997 questionnaire, 524 women developed epithelial ovarian cancer. After excluding women who reported a bilateral oophorectomy before baseline ($n = 43$) or had missing information on oophorectomy status ($n = 4$), premenopausal women ($n = 15$) or women with unknown menopausal status ($n = 16$), borderline or non-epithelial ovarian cancer ($n = 35$), and women without information on MHT type ($n = 16$), we had 395 incident epithelial ovarian cancers in our analysis. The NIH-AARP Diet and Health Study was approved by the Special Studies Institutional Review Board of the U.S. National Cancer Institute and all participants gave informed consent by virtue of completing and returning the questionnaire.

2.2. Tumor characteristics and treatment information

Date of cancer diagnosis, histology, stage, grade, and first course of treatment were available from cancer registries. Histology was defined using the *International Classification of Diseases for Oncology* (ICD-O 3rd Edition) and the American Joint Committee on Cancer Staging System was used for classification of stage. Ovarian cancer cases with the following histology codes were included for analysis: serous (8441, 8460, 8461) and non-serous (endometrioid: 8380, 8382, 8383; mucinous: 8480, 8482; other epithelial: 8000, 8010, 8012, 8022, 8041, 8050, 8071, 8076, 8255, 8260, 8310, 8320).

2.3. Mortality ascertainment

Addresses for cohort members were updated periodically based on information provided by the participants and through the National Change of Address database. Vital status and causes of death were ascertained using the U.S. Social Security Administration Death Master File and the National Death Index through December 31, 2011. ICD-9 and ICD-10 codes were used to identify deaths due to ovarian cancer (ICD-9: 183; ICD-10: C56).

2.4. Menopausal hormone therapy and covariate assessment

As previously described (Lacey et al., 2007), detailed MHT information, including dates of first use and last use, total duration of use, regimen, usual dose, and name of the pill taken for the longest time was collected. Women were classified as using EPT-only if the reported dates of estrogen use and progestin use overlapped or were within 90 days of each other. Sequential EPT was defined as progestin delivered for <15 days per cycle and continuous EPT was defined as progestin delivered for ≥15 days per cycle. Women who reported using ET and EPT without overlapping dates or with unknown duration of progestin were included in a separate category. The baseline questionnaire assessed demographics, body mass index (BMI), reproductive history, oral contraceptive use, menopausal status, and smoking status, which were all considered as confounders.

2.5. Statistical analysis

Multivariable Cox proportional hazards regression models were used to estimate adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) for ovarian cancer-specific mortality with age as the underlying time metric. Follow-up time started at age of ovarian cancer diagnosis and ended at age of death or end of follow-up, whichever occurred first. The proportional hazards assumption was evaluated with likelihood ratio (LR) tests comparing models with and without interaction terms between MHT type and follow-up time.

We examined relationships between any MHT use and MHT type (no MHT, ET-only, EPT-only, combinations of ET and EPT) with ovarian cancer-specific mortality. Associations between recency of ET-only or EPT-only, and EPT-only regimen (sequential vs. continuous) with mortality were assessed in separate models that included indicator variables for other MHT types. Models were adjusted for stage, histology, grade, surgery, radiotherapy, chemotherapy, years from questionnaire to diagnosis, race, parity, diabetes, age at menopause, education, and years from questionnaire to diagnosis. Analyses were repeated stratified by histology (serous vs. non-serous). We assessed effect modification by histology using LR tests comparing models with and without interaction terms between MHT type and histology. Missing data were treated as separate categories for relevant variables. All analyses were performed using SAS 9.3 software (SAS Institute Inc., Cary, NC).

3. Results

Our cohort consisted of 395 women diagnosed with incident epithelial ovarian cancer including 210 serous, 28 endometrioid, 20 mucinous, and 137 other cases. Women were diagnosed a median of 4.6 years (minimum < 0.1, maximum = 10.2) after the 1996–1997 questionnaire was administered. We identified 283 deaths through 2011, of which, 239 were due to ovarian cancer. Median follow-up time from ovarian cancer diagnosis to death or end of follow-up was 3.4 years (minimum < 0.1, maximum = 14.9).

Baseline characteristics of our study population according to MHT type are shown in Table 1. One hundred seventy one women (43.3%) never used MHT, while 94 (23.8%) used ET-only, 88 (22.3%) used EPT-only, and 42 (10.6%) used combinations of ET and EPT. Compared with non-MHT users, ET-only users were more likely to be younger at enrolment, normal-weight, oral contraceptive users, post-surgically menopausal, and non-diabetic; EPT-only users were more likely to be younger at enrolment, highly educated, normal-weight, former smokers, oral contraceptive users, younger when they experienced natural menopause, and non-diabetic. Years from the 1996–1997 questionnaire to ovarian cancer diagnosis did not differ according to MHT type (data not shown, Kruskal–Wallis $p = 0.33$).

3.1. Ovarian cancer-specific mortality and MHT characteristics

Compared with never use, use of any MHT was unrelated to ovarian cancer-specific mortality overall (HR = 1.00, 95% CI = 0.75–1.33) or among serous (HR = 1.12, 95% CI = 0.76–1.66) or non-serous cases (HR = 1.06, 95% CI = 0.18–2.55). We observed no significant relationship between ovarian cancer-specific mortality with ET-only use (HR = 1.09, 95% CI = 0.70–1.68), recency of ET use (former: HR = 0.80, 95% CI = 0.40–1.59; current: HR = 1.24, 95% CI = 0.77–2.01), EPT-only use (HR = 0.97, 95% CI = 0.68–1.38), regimen of EPT use (sequential: HR = 0.91, 95% CI = 0.50–1.63; continuous: HR = 1.00, 95% CI = 0.68–1.48), or recency of EPT use (former: HR = 1.08, 95% CI = 0.57–2.04; current: HR = 0.94, 95% CI = 0.64–1.38) (Table 2).

3.2. Ovarian cancer-specific mortality and MHT characteristics: stratification by histology

In analyses stratified by histology (serous versus non-serous), we did not observe significant associations among women who developed serous or non-serous tumors for any category of MHT use. Despite the lack of statistical significance in either stratum, effect estimates for MHT type were significantly heterogeneous by histology (p-heterogeneity = 0.01) (Table 2).

4. Discussion

In this study of women diagnosed with ovarian cancer, there were no significant relationships between ovarian cancer-specific death and MHT type, recency of MHT use, or EPT regimen. Although none of the relationships between MHT and ovarian cancer-specific mortality were significant within histology-defined strata, we observed significant effect modification by histology.

Three previous studies (Mascarenhas et al., 2006; Wernli et al., 2008; Hein et al., 2013), which included between 244 and 751 ovarian cancer

Table 1
Distribution of baseline and tumor characteristics among 395 postmenopausal women diagnosed with epithelial ovarian cancer in relation to menopausal hormone use at the time of the second risk factor questionnaire in the NIH-AARP Diet and Health Study.

	Never use		ET-only		EPT-only		Combination ET/EPT		*p*-Value[a]
	(*n* = 171)		(*n* = 94)		(*n* = 88)		(*n* = 42)		
	N[b]	%	N[b]	%	N[b]	%	N[b]	%	
Age at baseline entry, years									0.03
<55	18	10.5	6	6.4	12	13.6	2	4.8	
55–59	23	13.5	21	22.3	27	30.7	8	19.0	
60–64	42	24.6	29	30.9	25	28.4	10	23.8	
65–69	78	45.6	34	36.2	22	25.0	20	47.6	
≥70	10	5.8	4	4.3	2	2.3	2	4.8	
Education									0.005
Less than high school/high school graduate	54	31.6	24	25.5	18	20.4	8	19.0	
Post-high school/some college	58	33.9	41	43.6	19	21.6	19	45.2	
College or graduate degree	55	32.2	28	29.8	49	55.7	15	35.7	
Race/ethnicity									0.21
White	153	89.5	89	94.7	84	95.5	40	95.2	
Non-white	18	10.5	5	5.3	4	4.5	2	4.8	
BMI (kg/m^2)									0.0004
Normal (<25)	52	30.4	52	55.3	48	54.5	25	59.5	
Overweight (25–29.99)	55	32.2	21	22.3	22	25.0	12	28.6	
Obese (≥30)	54	31.6	16	17.0	16	18.2	5	11.9	
Smoking status									0.005
Never	92	53.8	44	46.8	47	53.4	16	38.1	
Former	53	31.0	30	31.9	35	39.8	22	52.4	
Current	25	14.6	14	14.9	5	5.7	4	9.5	
Age at menarche									0.70
≤12	82	48.0	44	46.8	42	47.7	25	59.5	
13–14	79	46.2	43	45.7	39	44.3	13	31.0	
≥15	10	5.8	7	7.4	7	8	4	9.5	
Parity									0.08
Nulliparous	42	24.6	11	11.7	20	22.7	4	9.5	
1–2	63	36.8	34	36.2	39	44.3	19	45.2	
≥3	65	38.0	49	52.1	29	33.0	19	45.2	
Oral contraceptive use									0.02
Never	131	76.6	66	70.2	50	56.8	23	54.8	
Ever	38	22.2	27	28.7	36	40.9	18	42.9	
Age at menopause									<0.0001
<45	15	8.8	2	2.1	3	3.4	2	4.8	
45–49	39	22.8	12	12.8	20	22.7	13	31.0	
50–54	75	43.9	8	8.5	50	56.8	13	31.0	
≥55	21	12.3	2	2.1	14	15.9	2	4.8	
Surgical	21	12.3	70	74.5	1	1.1	12	28.6	
History of diabetes									0.03
No	152	88.9	90	95.7	85	96.6	41	97.6	
Yes	19	11.1	4	4.3	3	3.4	1	2.4	
Histology									0.08
Serous	80	46.8	52	55.3	56	63.6	22	52.4	
Non-serous	91	53.2	42	44.7	32	36.4	20	47.6	
Tumor summary stage									0.45
Localized	15	8.8	5	5.3	7	8.0	0	0.0	
Regional/distant	102	59.6	55	58.5	50	56.8	24	57.1	
Tumor grade at diagnosis									0.36
Well differentiated	5	2.9	7	7.4	5	5.7	1	2.4	
Moderately differentiated	27	15.8	20	21.3	12	13.6	3	7.1	
Poorly differentiated	93	54.4	44	46.8	49	55.7	23	54.8	
First course of treatment[c]									
Surgery	103	60.2	75	79.8	69	78.4	35	83.3	0.0003
Chemotherapy	94	55.0	71	75.5	58	65.9	33	78.6	0.002
Radiation	2	1.2	0	0.0	1	1.1	0	0.0	0.04

Abbreviations: BMI: body mass index, EPT: estrogen plus progestin therapy, ET: estrogen therapy.
[a] chi-square *p*-value comparing never use, estrogen-only, estrogen plus progestin-only, and combination ET/EPT. Fisher *p*-value reported when 25% of cells have counts less than 5.
[b] Numbers may not add to total due to missing values.
[c] Categories are not mutually exclusive and may exceed the total number of cases in the category.

cases, examined pre-diagnosis MHT use and survival following an ovarian cancer diagnosis. Consistent with our findings, none reported associations between MHT use and survival in the overall study population; however, subgroup analyses revealed some associations. In one study, ever use of MHT (all types combined) was associated with improved survival among women who developed serous ovarian cancers (Mascarenhas et al., 2006) and in another, improved survival related to ever use of MHT (all types combined) was observed among ovarian cancer cases that underwent optimal tumor debulking (Hein et al., 2013). Neither of the two studies that examined specific MHT type in relation to survival reported significant associations (Mascarenhas et al., 2006; Wernli et al., 2008). Unlike our analysis, these two studies did not stratify by histology. Furthermore, unlike previous studies, we were able to adjust for tumor characteristics (Mascarenhas et al., 2006) and treatment (Mascarenhas et al., 2006; Wernli et al., 2008).

Table 2
Hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between MHT type and ovarian cancer-specific mortality among 395 women diagnosed with ovarian cancer, overall and by ovarian cancer subtype, NIH-AARP Diet and Health Study.

	Overall ($n = 395$)		Serous ($n = 210$)		Non-serous ($n = 185$)[a]	
	Deaths/n	HR (95% CI)[b]	Deaths/n	HR (95% CI)[b]	Deaths/n	HR (95% CI)[b]
No MHT	105/171	1.00	55/80	1.00	50/91	1.00
Any MHT	134/224	1.00 (0.75, 1.33)	84/130	1.12 (0.76, 1.66)	50/94	1.06 (0.18, 2.55)
ET-only	53/94	1.09 (0.70, 1.68)	27/52	0.78 (0.42, 1.46)	26/42	1.77 (0.93, 3.36)
Recency of ET						
Former	11/21	0.80 (0.40, 1.59)	5/13	0.38 (0.14, 1.06)	6/8	1.83 (0.67, 4.95)
Current	42/73	1.24 (0.77, 2.01)	22/39	1.15 (0.56, 2.36)	20/34	1.75 (0.89, 3.47)
EPT-only[c]	54/88	0.97 (0.68, 1.38)	39/56	1.17 (0.74, 1.83)	15/32	0.78 (0.39, 1.55)
Sequential	15/28	0.91 (0.50, 1.63)	9/17	0.76 (0.41, 1.43)	6/11	1.48 (0.57, 3.85)
Continuous	39/59	1.00 (0.68, 1.48)	30/38	1.41 (0.86, 2.32)	9/21	0.57 (0.25, 1.30)
Recency of EPT-only						
Former	12/19	1.08 (0.57, 2.04)	6/9	1.29 (0.50, 3.29)	6/10	0.96 (0.37, 2.46)
Current	42/69	0.94 (0.64, 1.38)	33/47	1.15 (0.71, 1.84)	9/22	0.68 (0.30, 1.57)
Combinations of ET and EPT	27/42	0.97 (0.61, 1.53)	18/22	1.45 (0.79, 2.64)	9/20	0.77 (0.35, 1.71)

Abbreviations: CI: confidence interval, EPT: estrogen plus progestin therapy, ET: estrogen therapy, HR: hazard ratio and MHT: menopausal hormone therapy.
[a] Non-serous includes endometrioid, mucinous, and others.
[b] Adjusted for stage (localized, regional/distant, missing), grade (well-differentiated, moderately-differentiated, poorly differentiated), histology (serous, non-serous), surgery (yes, no), chemotherapy (yes, no), radiotherapy (yes, no), race (white, non-white), parity (nulliparous, 1–2 live births, ≥3 live births), diabetes (no, yes), age at menopause (<45, 45–49, 50–54, ≥55, surgical), education (≤high school degree, post-high school/some college, college/postgraduate), and years from questionnaire to diagnosis (continuous).
[c] Includes women who reported using sequential ($n = 28$), continuous ($n = 59$), or unknown regimen ($n = 1$) of EPT.

Use of MHT could affect ovarian cancer mortality through various mechanisms including altering circulating estradiol, estrone, and progesterone levels (Slater et al., 2001; Edlefsen et al., 2010). In vitro and in vivo mouse models have shown that estrogen increases ovarian tumor proliferation, invasion, and metastasis through estrogen receptor (Spillman et al., 2010), whereas progesterone abrogates these processes (Fauvet et al., 2006). Although we did not observe an association between ovarian tumor characteristics and MHT type, our study included a relatively small number of ovarian cancer cases, limiting our statistical power to investigate this hypothesis.

Strengths of our analysis include the availability of detailed MHT data, long duration of follow-up, and standard outcome assessment. Limitations of our study include the small sample size and the one-time assessment of MHT use, which does not necessarily reflect usage patterns after ovarian cancer diagnosis.

Gaining a better understanding of mechanisms affecting disease risk, progression, and cancer-specific survival can provide insight on prognosis and inform clinical decision-making. Although the literature suggests that MHT may be a promoter of ovarian carcinogenesis, as evidenced by both the decline in ovarian cancer incidence following the WHI announcement in 2002 (Yang et al., 2013) and increased risks suggested by a large meta-analysis (Collaborative Group on Epidemiological Studies of Ovarian Cancer, 2015), it does not appear that MHT is associated with progression once the cancer develops.

Conflict of interest statement
The authors declare that there are no conflicts of interest.

Acknowledgments

This research was supported by the Intramural Research Program of the NIH, National Cancer Institute. Cancer incidence data from the Atlanta metropolitan area were collected by the Georgia Center for Cancer Statistics, Department of Epidemiology, Rollins School of Public Health, Emory University. Cancer incidence data from California were collected by the California Department of Health Services, Cancer Surveillance Section. Cancer incidence data from the Detroit metropolitan area were collected by the Michigan Cancer Surveillance Program, Community Health Administration, State of Michigan. The Florida cancer incidence data used in this report were collected by the Florida Cancer Data System under contract with the Department of Health. Cancer incidence data from Louisiana were collected by the Louisiana Tumor Registry, Louisiana State University Medical Center in New Orleans. Cancer incidence data from New Jersey were collected by the New Jersey State Cancer Registry, Cancer Epidemiology Services, New Jersey State Department of Health and Senior Services. Cancer incidence data from North Carolina were collected by the North Carolina Central Cancer Registry. Cancer incidence data from Pennsylvania were supplied by the Division of Health Statistics and Research, Pennsylvania Department of Health, Harrisburg, Pennsylvania. Cancer incidence data from Arizona were collected by the Arizona Cancer Registry, Division of Public Health Services, Arizona Department of Health Services. Cancer incidence data from Texas were collected by the Texas Cancer Registry, Cancer Epidemiology and Surveillance Branch, Texas Department of State Health Services. The views expressed herein are solely those of the authors and do not necessarily reflect those of the contractor or the Florida Department of Health. The Pennsylvania Department of Health specifically disclaims responsibility for any analyses, interpretations, or conclusions.

References

Rossouw, J.E., Anderson, G.L., Prentice, R.L., LaCroix, A.Z., Kooperberg, C., Stefanick, M.L., et al., 2002. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. JAMA 288 (3), 321–333.
Ettinger, B., Wang, S.M., Leslie, R.S., Patel, B.V., Boulware, M.J., Mann, M.E., et al., 2012. Evolution of postmenopausal hormone therapy between 2002 and 2009. Menopause 19 (6), 610–615.
Yang, H.P., Anderson, W.F., Rosenberg, P.S., Trabert, B., Gierach, G.L., Wentzensen, N., et al., 2013. Ovarian cancer incidence trends in relation to changing patterns of menopausal hormone therapy use in the United States. J. Clin. Oncol. 31 (17), 2146–2151.
Hunn, J., Rodriguez, G.C., 2012. Ovarian cancer: etiology, risk factors, and epidemiology. Clin. Obstet. Gynecol. 55 (1), 3–23.
Rao, B.R., Slotman, B.J., 1991. Endocrine factors in common epithelial ovarian cancer. Endocr. Rev. 12 (1), 14–26.
Collaborative Group On Epidemiological Studies Of Ovarian Cancer, 2015. Menopausal hormone use and ovarian cancer risk: individual participant meta-analysis of 52 epidemiological studies. Lancet (Pubmed ID: 25684585).
Schatzkin, A., Subar, A.F., Thompson, F.E., Harlan, L.C., Tangrea, J., Hollenbeck, A.R., et al., 2001. Design and serendipity in establishing a large cohort with wide dietary intake distributions : the National Institutes of Health-American Association of Retired Persons Diet and Health Study. Am. J. Epidemiol. 154 (12), 1119–1125.
Lacey Jr., J.V., Leitzmann, M.F., Chang, S.C., Mouw, T., Hollenbeck, A.R., Schatzkin, A., et al., 2007. Endometrial cancer and menopausal hormone therapy in the National Institutes of Health-AARP Diet and Health Study cohort. Cancer 109 (7), 1303–1311.
Mascarenhas, C., Lambe, M., Bellocco, R., Bergfeldt, K., Riman, T., Persson, I., et al., 2006. Use of hormone replacement therapy before and after ovarian cancer diagnosis and ovarian cancer survival. Int. J. Cancer 119 (12), 2907–2915.
Wernli, K.J., Newcomb, P.A., Hampton, J.M., Trentham-Dietz, A., Egan, K.M., 2008. Hormone therapy and ovarian cancer: incidence and survival. Cancer Causes Control 19 (6), 605–613.

Hein, A., Thiel, F.C., Bayer, C.M., Fasching, P.A., Haberle, L., Lux, M.P., et al., 2013. Hormone replacement therapy and prognosis in ovarian cancer patients. Eur. J. Cancer Prev. 22 (1), 52–58.

Slater, C.C., Zhang, C., Hodis, H.N., Mack, W.J., Boostanfar, R., Shoupe, D., et al., 2001. Comparison of estrogen and androgen levels after oral estrogen replacement therapy. J. Reprod. Med. 46 (12), 1052–1056.

Edlefsen, K.L., Jackson, R.D., Prentice, R.L., Janssen, I., Rajkovic, A., O'Sullivan, M.J., et al., 2010. The effects of postmenopausal hormone therapy on serum estrogen, progesterone, and sex hormone-binding globulin levels in healthy postmenopausal women. Menopause 17 (3), 622–629.

Spillman, M.A., Manning, N.G., Dye, W.W., Sartorius, C.A., Post, M.D., Harrell, J.C., et al., 2010. Tissue-specific pathways for estrogen regulation of ovarian cancer growth and metastasis. Cancer Res. 70 (21), 8927–8936.

Fauvet, R., Dufournet Etienne, C., Poncelet, C., Bringuier, A.F., Feldmann, G., Darai, E., 2006. Effects of progesterone and anti-progestin (mifepristone) treatment on proliferation and apoptosis of the human ovarian cancer cell line, OVCAR-3. Oncol. Rep. 15 (4), 743–748.