ORIGINAL ARTICLE

Comparison of clinicopathologic variables in coexistence cancers of the endometrium and ovary: A review of 55 cases in an academic center in Iran

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Background: The coexistence primary cancers of the endometrium and ovary are relatively uncommon. The purpose of this study was to characterize patients diagnosed primary synchronous endometrial and ovarian cancer (SEOC), endometrial cancer (EC) with ovarian metastasis, and ovarian cancer (OC) with endometrial metastasis and compare clinicopathologic variables and prognosis. **Materials and Methods:** All the patients with diagnosis of both endometrium and OC, who hospitalized between 2002 and 2012 in an academic center affiliated to Tehran University of Medical Sciences, were evaluated with respect to different clinicopathologic variables, follow-up times, and outcomes. **Results:** Fifty-five patients had been diagnosed with both endometrium and OC. 17, 26, and 12 patients were diagnosed as SEOC, EC, and OC, respectively. The frequency of abnormal uterine bleeding was significantly lower in OC (16.7%) compared to others (58.8% in SEOC and 53.8% in EC). However, the abdominal/pelvic pain was significantly higher in OC (50%) compared to others (35.3% in SEOC and 34.6% in EC) ($P < 0.05$). Complex atypical hyperplasia (87.5%), endometriosis (88.8%), and endometrioid carcinoma (54.5%) was observed most in SEOC group. The duration of follow-up time was between 3 and 171 months with a mean of 16 months. There was no death in SEOC who followed. Survivals of patients between three group were statistically significant ($P = 0.032$). **Conclusion:** Our results showed that overall survival (OS) and progression-free survival (PFS) of SEOC patients is better than those with EC and OC ($P = 0.032$).

Key words: Coexistent disease, disease-free survival, endometrium carcinomas, neoplasm grading, neoplasm staging, ovarian cancer

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INTRODUCTION

The synchronous carcinoma in the endometrium and ovary is a relatively uncommon. It occurs in about 5% of patients with endometrial carcinoma and 10% of patients with ovarian carcinoma.[1] No surgical or histologic criteria exist by which to define whether this process reflects the synchronous malignant transformation in each organs, metastasis from the endometrium to the ovary, or even metastasis from the ovary to the endometrium. Their treatment remains highly variable from one institution to another, because of the prognosis is uncertain for these patients.[2] In 1985, Oranratanaphan *et al*. and Soliman *et al*. proposed a set of pathologic criteria to help distinguish metastatic disease from synchronous primary tumors.[3,4]

Although there are few studies evaluating the coexistence primary cancers of the endometrium and ovary and compare them with metastatic ones,[1,2] there is no study performed in Iran in this regard. As, the clinicopathologic variables and survival rate

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of these patients may differed in coexistence of these carcinomas compare to metastatic ones, we aimed to compare patients with synchronous endometrial and ovarian cancer (SEOC) with the patients with primary endometrial cancer (EC) with ovarian metastasis; and primary ovarian cancer (OC) with endometrial metastasis with respect to different clinicopathologic variables and survival rate.

MATERIALS AND METHODS

After obtaining the ethical approve from the Ethic Committee of Tehran University of Medical Sciences (research project number 21908), the pathology reports of all the patients with diagnosis of both endometrium and OC who hospitalized between 2002 and 2012 in the Women Hospital, affiliated to Tehran University of Medical Sciences, and underwent total hysterectomy, bilateral salpingo-oophorectomy, with partial or complete staging was evaluated in this retrospective study. All specimens were reviewed by one gynecologic pathologist. The clinicopathological criteria of Soliman *et al*.[4] to distinguish primary from metastatic tumors were used for evaluation indicated in [Tables 1-3].[3,4]

If the histological tumor in ovary and endometrium was different, it considered as primary ovarian and endometrial tumors and excluded from the study. When these tumors had same histology included in this study and divided into three subgroups:

1. SEOC
2. EC
3. OC

Patients' demographic characteristics, symptoms at diagnosis time, macroscopic and microscopic pathologic features, type of surgery, and adjuvant treatments were extracted from their medical records. Patients were followed with respect to outcomes (survival, relapse, and death). All the patients stages were reviewed and updated based on International Federation of Gynecology and Obstetrics (FIGO) 2009. The progression-free survival (PFS) was considered as the number of months from the date of surgery to the date of disease relapse or the date censored,[5] overall survival (OS) was calculated from the date of surgery to the date of last contact or death.[5] Data of the patients with death from causes other than synchronous endometrial/OC did not consider for the follow-up. Furthermore, their survival times were censored at the date of death and, therefore, were considered as lost follow-up. The Kaplan–Meier method was used for calculating the survival curves and rates. The log-rank test was also used for assessing the differences in survival. Assessment of the hazards ratio with corresponding 95% confidence intervals was calculated using the Cox proportional hazards model. Multivariate analysis, to determine independent prognostic factors was performed using the Cox regression model. A $P < 0.05$ in a two-sided test considered a significant difference. Statistical analyses were performed with SPSS software (version 22.0, SPSS Statistics, IBM).

Table 1: Pathologic criteria for primary endometrial cancer with ovarian metastasis

Histologic similarity of the tumors
Large endometrial tumor-small ovarian tumor(s)
Atypical endometrial hyperplasia additionally present
Deep myometrial invasion
Direct extension into the adnexa
Vascular space invasion in myometrium
Spread elsewhere in typical pattern of endometrial carcinoma
Ovarian tumor bilateral and/or multinodular
Hilar location, vascular space invasion, surface implants, or combination in ovary
Ovarian endometriosis absent
Aneuploidy with similar DNA indices or diploidy of both tumors*
Similar molecular genetic or karyotypic abnormalities in both tumors

*The possibility of tumor heterogeneity must be taken into account in the evaluation of ploidy findings

Table 2: Pathologic criteria for primary ovarian cancer with endometrial metastasis

Histologic similarity of the tumors
Large ovarian tumor-small endometrial tumor
Ovarian endometriosis present
Location in ovarian parenchyma
Direct extension from ovary predominantly into outer wall of uterus
Spread elsewhere in typical pattern of ovarian carcinoma
Ovarian tumor unilateral (80–90% of cases) and forming single mass
No atypical hyperplasia in endometrium
Aneuploidy with similar DNA indices or diploidy of both tumors*
Similar molecular genetic or karyotypic abnormalities in both tumors

*The possibility of tumor heterogeneity must be taken into account in the evaluation of ploidy findings

Table 3: Synchronous primary endometrial cancer and primary ovarian cancer

Histologic dissimilarity of the tumors
No or only superficial myometrial invasion of endometrial tumor
No vascular space invasion of endometrial tumor
Atypical endometrial hyperplasia additionally present
Absence of other evidence of spread of endometrial tumor
Ovarian tumor unilateral (80–90% of cases)
Ovarian tumor located in parenchyma
No vascular space invasion, surface implants, or predominant hilar location in ovary
Absence of other evidence of spread of ovarian tumor
Ovarian endometriosis present
Different ploidy of DNA indices, if aneuploid, of the tumors*
Dissimilar molecular genetic or karyotypic abnormalities in the tumors

*The possibility of tumor heterogeneity must be taken into account in the evaluation of ploidy findings

RESULTS

Fifty-five patients had been hospitalized between 2002 and 2012 with a diagnosis of both endometrium and OC. According to Soliman *et al*. criteria, 17, 26, and 12 patients diagnosed as primary SEOC, primary EC with ovarian metastasis, and primary OC with endometrial metastasis, respectively.

The ages of patients at diagnosis ranged from 26 to 83 years, with a median age of 53.62 years. The mean age of the SEOC (47.65 ± 7.5) was significantly lower than the EC (56.85 ± 14.6) and OC (55.08 ± 11).

Among presenting symptoms, the frequency of abnormal uterine bleeding (AUB) was significantly lower in OC (16.7%) compared to others (58.8% in SEOC and 53.8% in EC). However, the abdominal/pelvic pain was significantly higher in OC (50%) compared to others (35.3% in SEOC and 34.6% in EC). No significant differences were found with respect to parity ($P = 0.458$), menopausal status ($P = 0.767$), family history of cancer ($P = 0.534$), infertility ($P = 0.517$); and the past medical history including diabetes ($P = 0.402$), hypertension ($P = 0.330$), and hyperlipidemia ($P = 0.416$) among different groups.

Most endometrial tumors in SEOC and OC were <5 cm (76.5% and 66.7%) and most tumors in EC had size between 5 and 10 cm (57.7%) ($P < 0.001$). The endometrioid carcinoma was observed in 30 patients mostly in SEOC (14 patients) and EC (11 patients). Seventeen patients had serous papillary carcinoma mostly in EC (9 patients) and OC (6 patients). Three patients in SEOC and EC were clear cell carcinoma. Another high grade types including malignant mixed mullerian tumor (MMMT), adenosquamous cell carcinoma, and carcinoma with poorly differentiation mostly were in EC (15.4%). None of those cancers was observed in SEOC. In OC group, one patient had carcinoma with poorly differentiation.

Tumor grade was performed for endometrioid carcinoma. Tumor grade was 1 in 20 patients, 2 in 9 patients, and 3 in 5 patients. Data regarding the myometrial invasion, cervical involvement, uterine serosa, and parametrial involvement were specified in Table 4.

In 31 patients, endometrial condition around the tumor was specified. Eight cases had complex atypical hyperplasia (CAH) (seven cases in SEOC and one case in EC). In three patients, endometrial intraepithelial carcinoma and endometrial glandular dysplasia were reported that two cases exist in EC and one case in OC. Ovarian surface, peritubal soft tissue, fallopian tube, and bilateral ovarian involvement were shown in Table 5.

Table 4: Pathologic features of endometrial tumor

Feature	SEOC* (*n* = 17) (%)	EC** (*n* = 26) (%)
Myometrial involvement (%)		
<50	8 (47.1)	3 (11.5)
≥50	5 (29.4)	21 (80.8)
Limited to endometrium	4 (23.5)	2 (7.7)
Cervical involvement		
Yes	3 (17.6)	14 (53.8)
No	13 (76.5)	9 (34.6)
NS***	1 (5.9)	3 (11.6)
Serosal involvement		
Yes	0 (0)	14 (53.8)
No	16 (94.1)	4 (15.4)
NS***	1 (5.9)	8 (30.8)
Parametrial involvement		
Yes	1 (5.9)	10 (38.5)
No	16 (94.1)	6 (23)
NS***	0 (0)	10 (38.5)

*Synchronous endometrial and ovarian cancer; **Primary endometrial cancer with ovarian metastasis; ***Not specified

Table 5: Pathologic features of ovary

Feature	SEOC* (*n* = 17) (%)	OC** (*n* = 12) (%)
Peritubal soft tissue involvement		
Yes	2 (11.8)	3 (25.0)
No	14 (82.4)	1 (8.3)
NS***	1 (5.8)	8 (66.7)
Fallopian tube involvement		
Yes	0 (0)	7 (58.3)
No	17 (100)	2 (16.7)
NS***	0 (0)	3 (25.0)
Ovarian surface involvement		
Yes	5 (29.4)	8 (66.7)
No	11 (64.7)	3 (25.0)
NS***	1 (5.9)	1 (8.3)
Both ovary		
Both ovarian involvement	6 (35.3)	10 (83.4)
Only right ovary involvement	10 (58.8)	1 (8.3)
Only left ovary involvement	1 (5.9)	1 (8.3)

*Synchronous endometrial and ovarian cancer; **Primary ovarian cancer with endometrial metastasis; ***Not specified

In nine patients has been reported endometriosis that eight cases exist in SEOC and one case in OC. Pelvic and paraaortic lymph nodes, omentum, and other sites involvement in patients were presented in Table 6.

All the patients staged by FIGO 2009 which has been summarized in Tables 7 and 8. Among 55 patients, follow-up was available for 39 patients (SEOC: 15, EC: 19 and OC: 5). Sixteen patients did not come for the follow-up to our Gynecologic Clinic. There was no data follow-up for these patients and considered as the loss of follow-up cases. The duration of follow-up in three groups was between 3 and 171 months with a mean of 16 months. In SEOC, follow-up time was ranged from 4

to 171 months, with a mean of 21 months. In EC, it was from 3 to 81 months, with a mean of 12 months, and in OC, follow-up time was ranged from 6 to 19 months, with a mean of 13 months.

There was no death in SEOC who followed. Among 19 patients – who followed in EC group, 13 patients were alive without recurrence, two patients had relapsed of tumor after 6 months, but are alive, and four cases died (two patients 4 months, one patient 6 months, and the one patient 12 months after diagnosis).

Among five patients with available follow-up in OC, one patient showed relapse 2 months and one case died 18 months after diagnosis. Survivals of patients between three group were statistically significant (P = 0.032). Characteristics of patients with relapse and death were presented in Table 9. SEOC group had higher PFS and OS than metastatic groups as mentioned below:

1. SEOC group:
   a. OS: 5 years = 100%; 100 months = 100%.
   b. PFS: 1 years = 89% (SE: 11%); 31 months = 89% (SE: 11%).
2. EC group:
   a. OS: 1 years = 72% (SE: 12%); 81 months = 72% (SE: 12%).
   b. PFS: 1 years = 75% (SE: 12%); 81 months = 82% (SE: 12%).
3. OC group:
   a. OS: 1 year = 100%; 18 months = 50% (SE: 35%).
   b. PFS: 1 year = 75% (SE: 22%) [Figures 1 and 2].

DISCUSSION

The coexistence endometrial and OC is a challenging subject in gynecologic oncology practice as it has been associated with therapeutic and prognostic significance.

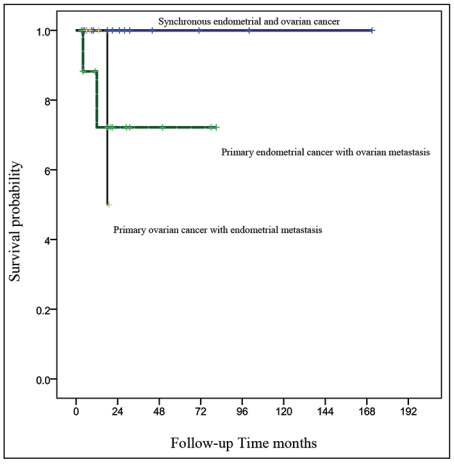

Figure 1: Overall survival analysis of synchronous endometrial and ovarian cancer, metastatic endometrial and ovarian carcinomas

Oranratanaphan *et al*. and Soliman *et al*. defined a group of histological criteria for differential diagnosis of the

Table 6: Other site of metastasis in studied patients

Feature	SEOC* (*n* = 17) (%)	EC** (*n* = 26) (%)	OC*** (*n* = 12) (%)
Pelvic lymph nodes involvement			
Yes	0 (0)	3 (11.5)	1 (8.3)
No	10 (58.8)	10 (38.5)	1 (8.3)
NS****	7 (41.2)	13 (50.0)	10 (83.4)
Paraaortic lymph nodes involvement			
Yes	0 (0)	2 (7.7)	0 (0)
No	3 (17.6)	2 (7.7)	0 (0)
NS****	14 (82.4)	22 (84.6)	12 (100)
Omentum involvement			
Yes	1 (5.9)	8 (30.8)	8 (66.6)
No	11 (64.7)	8 (30.8)	2 (16.7)
NS****	5 (29.4)	10 (38.4)	2 (16.7)
Other site involvement			
Yes	0 (0)	6 (23.1)	4 (33.3)
No	2 (11.8)	0 (0)	3 (25)
NS****	15 (88.2)	20 (76.9)	5 (41.7)

*Synchronous endometrial and ovarian cancer; **Primary endometrial cancer with ovarian metastasis; ***Primary ovarian cancer with endometrial metastasis; ****Not specified

Table 7: FIGO staging of endometrial cancer

Stage	SEOC* (*n* = 17) (%)	EC** (*n* = 26) (%)	OC*** (*n* = 12) (%)
I	13 (76.5)	0 (0)	–
II	3 (17.6)	0 (0)	–
III	0 (0)	17 (65.4)	–
IV	0 (0)	9 (34.6)	–
NS****	1 (5.9)	0 (0)	–

*Synchronous endometrial and ovarian cancer; **Primary endometrial cancer with ovarian metastasis; ***Primary ovarian cancer with endometrial metastasis; ****Not specified; FIGO=International Federation of Gynecology and Obstetrics

Table 8: FIGO staging of ovarian cancer

Stage	SEOC* (*n* = 17) (%)	EC** (*n* = 26) |(%)	OC*** (*n* = 12) (%)
I	13 (76.5)	–	0 (0)
II	3 (17.6)	–	3 (25)
III	1 (5.9)	–	9 (75)
NS****	0 (0)	–	0 (0)

*Synchronous endometrial and ovarian cancer; **Primary endometrial cancer with ovarian metastasis; ***Primary ovarian cancer with endometrial metastasis; ****Not specified; FIGO=International Federation of Gynecology and Obstetrics

Table 9: Characteristics of patients with relapse and dead

Patient outcome	SEOC* (*n* = 17) (%)	EC** (*n* = 26) (%)	OC*** (*n* = 12) (%)	Total (*n* = 55) (%)
Alive	14 (82.3)	13 (50)	3 (25)	30 (54.5)
Alive and relapse	1 (5.9)	2 (7.7)	1 (8.3)	4 (7.3)
Dead	0 (0)	4 (15.4)	1 (8.3)	5 (9.1)
Not specified	2 (11.8)	7 (26.9)	7 (58.4)	16 (29.1)

*Synchronous endometrial and ovarian cancer; **Primary endometrial cancer with ovarian metastasis; ***Primary ovarian cancer with endometrial metastasis

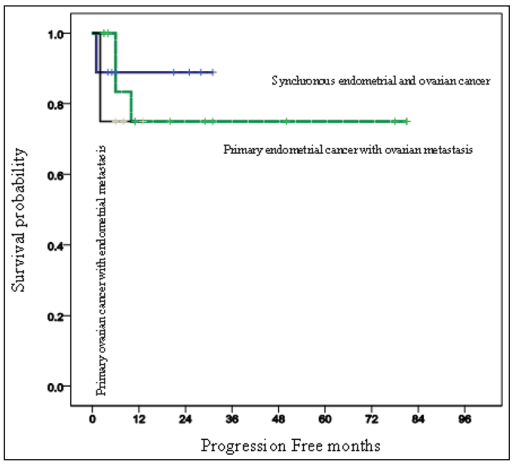

Figure 2: Progression-free survival analysis of synchronous endometrial and ovarian cancer, metastatic endometrial and ovarian carcinomas

early coexistence of endometrial and OC from metastatic ones.[3,4]

In our study, age of patients in the SEOC was significantly lower than the group of endometrial metastatic (47 years vs. 54 years). In a study conducted by Oranratanaphan *et al*. the differences in age was also significant between the primary and metastatic groups.[3] Abnormal uterine bleeding in our patients was significantly less in metastatic ovarian carcinoma than the other two groups. However, the abdominal/pelvic pain was more observed in metastatic ovarian carcinoma compared to other two groups. The symptoms in our study were similar to other studies performed by Oranratanaphan *et al*. and Soliman *et al*.[3,4]

The histological type of tumor and its grade showed differences among groups. The majority of patients in groups SEOC and EC had endometrioid histology; however, papillary serous carcinoma was observed more in group OC.[6] Other histological types include MMMT (two patients), adenosquamous (one patient), and carcinomas with poorly differentiation (two patients) only were seen in group EC. The majority of patients in group SEOC were mostly with well-differentiated tumors but in group EC and OC they were with moderately or poorly differentiated cancers. In addition, size of the tumor ($P < 0.001$) and involvement of uterine serosa in the three groups was significantly different. These histopathological findings in our study are similar to the result of some researches.[5,7,8]

Lymph vascular spaces invasion in our study was similar to others.[2,4,7,9] Involvement of bilateral ovaries and the soft tissue around the tube in EC was higher than the other two groups. However, fallopian tube involvement was higher in group OC rather than the others. In SEOC, there was no involvement of fallopian tube. Pelvic lymph node metastasis occurred in group EC (11.5%) and group OC (8.3%); however, paraaortic lymph node metastasis only seen in group EC (7.7%). No pelvic or paraaortic lymph node metastasis was found in group SEOC. The highest involvement of omentum was found in Group OC which was significant compared with other groups.

There are also significant differences among group SEOC with respect to CAH compared to the other two groups. Endometriosis showed also a significant difference between group SEOC and the other groups which was in accordance with the study of Kobayashi *et al*.[8] Papillary serous carcinoma was observed in histology of all three cases.

In the Trainee study, with an average follow-up of 45 months, five patients with primary tumor and 24 patients in the metastatic group had a recurrence. Death due to the cancer happened in three patients with primary tumors and in all patients with metastatic tumors. In our study, follow-up period was 4-117 months, with the mean follow-up time 16 months in all three groups. Our patients with synchronous primary endometrial and ovarian tumors had a better OS (100 months) than other groups (EC: 81 months, OC: 18 months). In Soliman *et al*. patients with concordant endometrioied tumors of ovary and endometrium had a better median OS (119 months) than those with none endometrioied or mixed histologic subtypes (48 months).[4] In our study, recurrence was occurred in four cases and death was happened in five patients. The difference with other studies could be due to the different follow-up times[3] and different histology and tumor grade as the most cases of recurrence and death in our study were with histology of EC type 2 mostly with high grades and in advanced stages.

In some studies, the prognosis of patients with simultaneously primary cancer both in endometrial and ovary has been reported better than primary EC (Stage 3A) with metastasis to ovary or OC (Stage 2A) with endometrial metastasis[3,4] In our study, similar to Oranratanaphan *et al*., Soliman *et al*. and Williams *et al*. studies, patients in the SEOC group are mostly young obese women before menopause, without any children, with low grade tumor and a good prognosis.[3,4,10]

However, in 2013, Heitz *et al*. reported that simultaneous primary ovarian and EC had the same prognosis compared with endometrial or OC alone. However, in our study the prognosis for patients with synchronous primary ovarian and endometrial tumor was better than ovarian or endometrial tumor alone which is similar to the study performed by Zaino *et al*.[2] Matching the patients in terms of age, histology, and stage in Heitz *et al*. study could be the reason for this difference.[11]

CONCLUSION

The coexistence primary cancers of the endometrium and ovary are relatively uncommon in our society. Fifty-five patients had been diagnosed with both endometrium and OC within 10 years. Most of the patients were SEOC. The frequency of AUB was significantly lower in OC compared to others. However, the abdominal/pelvic pain was significantly higher in OC. CAH, endometriosis, and endometrioid carcinoma was observed most in SEOC group. There was no death in SEOC who followed. A survivals of patients between three groups were statistically significant.

Careful preoperative and intraoperative assessment of the adnexa is mandatory in young women with EC. Those who desire ovarian preservation regarding the high rate of coexisting ovarian malignancy.

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Conflicts of interest

There are no conflicts of interest.

AUTHOR'S CONTRIBUTIONS

NI-M carried out the design, coordinated the study, prepared the manuscript and approved the content of the manuscript. HS assistance the design, gathered the data, coordinated the study, prepared the manuscript and approved the content of the manuscript. SS provide assistance in the design of the study, coordinated and participated in manuscript preparation and approved the content of the manuscript. FY provide assistance in the design of the study, coordinated and participated in manuscript preparation and approved the content of the manuscript. SA-M provide assistance in the design of the study, coordinated and participated in manuscript preparation and approved the content of the manuscript. FE provided assistance for statistical analyses and manuscript preparation and approved the content of the manuscript. MS provide assistance in the design of the study, coordinated and participated in manuscript preparation and manuscript preparation and approved the content of the manuscript.

REFERENCES

1. Broeders FM, van der Wurff AA, Pijnenborg JM, Vos MC. Preoperative identification of synchronous ovarian and endometrial cancers: The importance of appropriate workup. Int J Gynecol Cancer 2012;22:1325-31.
2. Zaino R, Whitney C, Brady MF, DeGeest K, Burger RA, Buller RE. Simultaneously detected endometrial and ovarian carcinomas — A prospective clinicopathologic study of 74 cases: A gynecologic oncology group study. Gynecol Oncol 2001;83:355-62.
3. Oranratanaphan S, Manchana T, Sirisabya N. Clinicopathologic variables and survival comparison of patients with synchronous endometrial and ovarian cancers versus primary endometrial cancer with ovarian metastasis. Asian Pac J Cancer Prev 2008;9:403-7.
4. Soliman PT, Slomovitz BM, Broaddus RR, Sun CC, Oh JC, Eifel PJ, *et al.* Synchronous primary cancers of the endometrium and ovary: A single institution review of 84 cases. Gynecol Oncol 2004;94:456-62.
5. Song T, Seong SJ, Bae DS, Kim JH, Suh DH, Lee KH, *et al.* Prognostic factors in women with synchronous endometrial and ovarian cancers. Int J Gynecol Cancer 2014;24:520-7.
6. van Niekerk CC, Bulten J, Vooijs GP, Verbeek AL. The association between primary endometrioid carcinoma of the ovary and synchronous malignancy of the endometrium. Obstet Gynecol Int 2010;2010:465162.
7. Chen L, Zhao Q, Lv X. Characteristics and prognosis of coexisting adnexa malignancy with endometrial cancer: A single institution review of 51 cases. Arch Gynecol Obstet 2011;283:1133-7.
8. Kobayashi Y, Nakamura K, Nomura H, Banno K, Irie H, Adachi M, *et al.* Clinicopathologic analysis with immunohistochemistry for DNA mismatch repair protein expression in synchronous primary endometrial and ovarian cancers. Int J Gynecol Cancer 2015;25:440-6.
9. Karki S, Chapagain U. Synchronous primary tumors of the endometrium and ovary. J Pathol Nepal 2012;2:189-92.
10. Williams MG, Bandera EV, Demissie K, Rodríguez-Rodríguez L. Synchronous primary ovarian and endometrial cancers: A population-based assessment of survival. Obstet Gynecol 2009;113:783-9.
11. Heitz F, Amant F, Fotopoulou C, Battista MJ, Wimberger P, Traut A, *et al.* Synchronous ovarian and endometrial cancer – an international multicenter case-control study. Int J Gynecol Cancer 2014;24:54-60.