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Original Article

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Is restaging surgery quintessential in suspected early-stage epithelial ovarian cancer? An ancillary study of the Gynecologic Oncology Research Investigators coLLaborAtion study (GORILLA-3002)

Jung Chul Kim,[1] **Eun Jung Yang**,[2] **A Jin Lee**,[3] **Woo Yeon Hwang**,[4] **Suk-Joon Chang**,[5] **Hee Seung Kim**,[6] **Namkyeong Kim**,[4] **Tae Wook Kong**,[5] **Eun Ji Lee**,[6] **Joo-Hyuk Son**,[5] **Dong Hoon Suh**,[4] **Seung-Hyuk Shim**,[3] **Eun Ji Nam**[1]

[1]Department of Obstetrics and Gynecology, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea
[2]Department of Obstetrics and Gynecology, Soonchunhyang University Cheonan Hospital, Cheonan, Korea
[3]Department of Obstetrics and Gynecology, Research Institute of Medical Science, Konkuk University School of Medicine, Seoul, Korea
[4]Department of Obstetrics and Gynecology, Seoul National University Bundang Hospital, Seongnam, Korea
[5]Department of Obstetrics and Gynecology, Ajou University School of Medicine, Suwon, Korea
[6]Department of Obstetrics and Gynecology, Seoul National University College of Medicine, Seoul, Korea

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Correspondence to
Eun Ji Nam
Department of Obstetrics and Gynecology, Severance Hospital, Yonsei University College of Medicine, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea.
Email: NAHMEJ6@yuhs.ac

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ORCID iDs
Jung Chul Kim
https://orcid.org/0000-0001-8979-6815
Eun Jung Yang
https://orcid.org/0000-0001-9826-3519
A Jin Lee
https://orcid.org/0000-0001-5456-5195
Woo Yeon Hwang
https://orcid.org/0000-0003-0231-8330

ABSTRACT

Objective: To assess the necessity of restaging surgery for patients with suspected International Federation of Gynecology and Obstetrics (FIGO) stage I–II epithelial ovarian cancer (EOC) following incomplete surgical staging.
Methods: This multicenter retrospective study evaluated patients with early-stage EOC referred for restaging. These patients were diagnosed with suspected FIGO stage I–II EOC between January 2007 and November 2022 after incomplete surgical staging, and no residual region was confirmed by radiological evaluation. Progression-free survival (PFS) and overall survival (OS) were examined.
Results: Among the 173 patients included in the study, 56 were assigned to the no restaging surgery group, and 117 to the restaging surgery group. After restaging, 23 were upstaged to other main stage. However, PFS and OS were not significantly different between the groups, also, dividing the groups into 4 groups who underwent chemotherapy and those who did not also did not show significant differences. In multivariate analysis, histologic grade independently influenced PFS outcomes.
Conclusion: While restaging surgery resulted in upstaging in some patients, it was not associated with significant differences in PFS or OS in this retrospective analysis. However, the omission of any additional treatment warrants careful consideration and further discussion. Nevertheless, the observation that patients who did not undergo restaging surgery but received adjuvant chemotherapy did not show significantly different prognoses highlights the need for further research to establish appropriate treatment strategies tailored to diverse patient contexts.

Keywords: Ovarian Neoplasms; Reoperation; Progression-Free Survival; Survival Rate

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Suk-Joon Chang
https://orcid.org/0000-0002-0558-0038
Hee Seung Kim
https://orcid.org/0000-0001-6876-8671
Namkyeong Kim
https://orcid.org/0000-0001-6345-3603
Tae Wook Kong
https://orcid.org/0000-0002-9007-565X
Eun Ji Lee
https://orcid.org/0000-0002-0251-8079
Joo-Hyuk Son
https://orcid.org/0000-0002-3712-8409
Dong Hoon Suh
https://orcid.org/0000-0002-4312-966X
Seung-Hyuk Shim
https://orcid.org/0000-0001-8043-2257
Eun Ji Nam
https://orcid.org/0000-0003-0189-3560

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

Conceptualization: N.E.J.; Data curation: K.J.C., Y.E.J., L.A.J., H.W.Y., K.N., S.J.H.; Formal analysis; K.J.C.; Methodology: C.S.J., K.H.S., K.T.W., S.D.H., S.S.H., N.E.J.; Project administration; N.E.J.; Resources: K.J.C., Y.E.J., L.A.J., H.W.Y., C.S.J., K.H.S., K.N., K.T.W., L.E.J., S.J.H., S.D.H., S.S.H., N.E.J.; Supervision: N.E.J.; Validation: K.J.C., N.E.J.; Visualization: K.J.C.; Writing - original draft; K.J.C.; Writing - review & editing: N.E.J.

Synopsis

Although restaging identified hidden advanced stages, it did not enhance patient survival. Comparable outcomes were observed with or without restaging when adjuvant chemotherapy was administered. Histologic grade significantly influenced prognosis. These results support individualized treatment over routine restaging.

INTRODUCTION

Ovarian cancer has the second-highest mortality rate among gynecological cancers. In 2020, 207,252 related deaths have been reported, and 313,959 incident cases, accounting for 1.6% of all cancers, have been identified [1,2]. Epithelial ovarian cancer (EOC) accounts for 90% of all ovarian cancers and is highly lethal [3]. Therefore, the National Comprehensive Cancer Network (NCCN) guidelines recommend complete surgical staging as the treatment goal, even in patients with early-stage EOC [4]. Complete surgical staging includes peritoneal cytological examination, biopsy of any peritoneal surface or adhesion suspicious for metastasis, omentectomy, appendectomy, pelvic lymph node dissection, para-aortic lymph node dissection, hysterectomy, and bilateral salpingo-oophorectomy (BSO). In patients where fertility preservation is necessary, options such as unilateral salpingo-oophorectomy (USO) or BSO with uterine preservation may be considered, depending on the disease stage [4]. Therefore, the aforementioned surgical staging is recommended even for patients who have undergone incomplete surgery. This recommendation is based on reports indicating that approximately 30% of EOC cases are upstaged through restaging surgeries and the extent of upstaging varies according to histological type [5,6].

Nevertheless, notwithstanding the acknowledged importance of these restaging procedures, certain patients decline surgery or are medically unfit for the intervention. In such cases, it becomes imperative to explore alternative approaches, such as chemotherapy to mitigate the risk of ovarian cancer. Thus, this study aimed to determine the need for restaging surgery in patients with suspected early-stage EOC who have undergone incomplete surgical staging. In addition, we aimed to perform subgroup analyses based on the administration of adjuvant chemotherapy to compare outcomes within each treatment group.

MATERIALS AND METHODS

1. Ethics

This study broadened its scope and obtained ethical approval from the Institutional Review Boards of the institutions involved by integrating data from Severance Hospital into the multicenter retrospective cohort study GORILLA-3002 in Korea (YUHS 4-2023-1683). The need for informed consent was waived owing to the retrospective nature of the study.

2. Study population

Patients with suspected early-stage EOC were identified from the electronic medical records (EMRs) of the participating institutions and screened between September 2007 and December 2022. The inclusion criteria were as follows: 1) underwent incomplete surgical staging surgery (i.e., cystectomy, USO, BSO, and total hysterectomy [TH]) for the treatment of ovarian mass and was diagnosed with EOC; 2) was evaluated with imaging modalities (pelvic magnetic

resonance imaging [MRI], pelvic computed tomography [CT], positron emission tomography [PET]-computed tomography) and no other cancerous lesions; and 3) had a good performance status for surgery, defined as an Eastern Cooperative Oncology Group performance status [ECOG-PS] score of ≤2. The exclusion criteria were as follows: 1) a short follow-up period of <3 months; 2) non-EOC; 3) suspected metastasis to the retroperitoneal lymph nodes or outside the pelvis on imaging and/or clinical examination; 4) underwent surgery equivalent to a staging surgery at the time of the first surgery; 5) neoadjuvant chemotherapy; and 6) history of other malignancies or underlying diseases that may affect survival. To better reflect the heterogeneity of real-world clinical management, patients were further subdivided into four groups based on whether they underwent restaging surgery and/or received adjuvant chemotherapy. In both the restaging and no-restaging groups, some patients received postoperative chemotherapy based on histologic risk factors, clinical judgment, or patient preference. Therefore, the four groups were defined as: no further treatment, chemotherapy-only, restaging surgery-only, and restaging surgery with adjuvant chemotherapy.

3. Data collection

Demographic and clinicopathological data were collected from EMRs. These included age, body mass index, parity, ECOG-PS score, Charlson Comorbidity Index, preoperative serum CA-125 level, assumed clinical stage, histological type, and definitive pathological International Federation of Gynecology and Obstetrics stage, as determined by findings from the restaging surgery. In addition, treatment details, including surgical interventions and adjuvant chemotherapy regimens, were documented. The research participants included gynecologic oncologists certified by the Korean Society of Gynaecologic Oncology. Standard procedures for surgical staging included TH, BSO, cytological tests for ascites or peritoneal washings, resection of suspected peritoneal lesions, omentectomy, and lymph node dissection in the pelvic and para-aortic regions. The completion of all procedures was not compulsory. The main outcome measure was progression-free survival (PFS), defined as the interval from initial surgery to recurrence or last follow-up and overall survival (OS), defined as the time from the first surgery to death or the last follow-up. The secondary outcome measures included univariate and multivariate analyses to assess their influence on the PFS, OS.

4. Statistical analysis

Clinicodemographic characteristics were compared using the Fisher's exact test for categorical data and the Wilcoxon rank-sum test for continuous data and were significant with $p<0.05$. The incidence rate of recurrence (recurrence rate) was calculated for each subgroup. PFS and OS survival curves were generated using the Kaplan-Meier method and compared among the four groups using the log-rank test. Differences were considered significant at a p-value of <0.05. A Cox regression model was used to analyze the prognostic significance of each treatment. Significant variables (i.e., those with $p<0.1$ in univariable analysis) were included in the multivariable analysis and were considered significant with $p<0.05$. All statistical analyses were performed using the IBM SPSS statistics software (version 21.0; IBM Corp., Armonk, NY, USA) and Prism software (GraphPad, La Jolla, CA, USA).

RESULTS

1. Patient characteristics and treatments

A total of 173 patients were evaluated; among them, 56 and 117 patients were categorized into the no restaging surgery and restaging surgery groups, respectively (**Fig. 1**).

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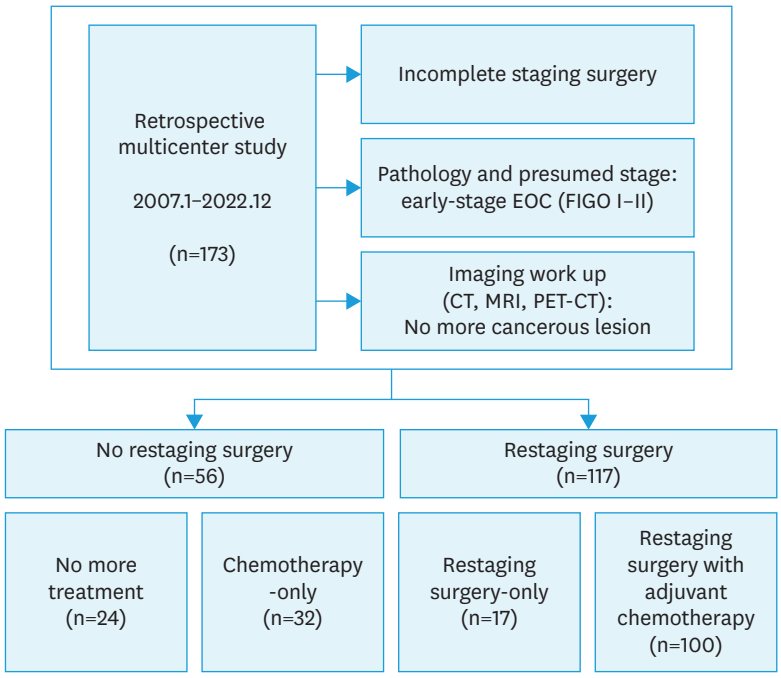

Fig. 1. Patient selection flowchart.
CT, computed tomography; EOC, epithelial ovarian cancer; FIGO, International Federation of Gynecology and Obstetrics; MRI, magnetic resonance imaging; PET-CT, positron emission tomography-computed tomography.

The characteristics of the two groups divided based on the presence or absence of restaging operation were analyzed; no restaging surgery and restaging surgery groups (**Table 1**). The 2 groups were further subdivided into four subgroups based on whether chemotherapy was administered, and the analysis was performed accordingly; no more treatment (n=24), chemotherapy-only (n=32), restaging surgery-only (n=17) and restaging surgery with adjuvant chemotherapy groups (n=100) (**Table S1**). Significant differences in characteristics were observed between the two groups in parity, *BRCA* mutation status, histology, histologic grade, and type of initial surgery. Likewise, these differences were consistently significant across the four subgroups.

Regarding parity, 62/173 patients (35.8%) were nulliparous. The proportion of nulliparous patients was higher in the no restaging surgery group (26/56, 46.4%) compared to the restaging surgery group (36/117, 30.8%). Among the subdivided groups, the number of nulliparous patients was highest in the restaging surgery with adjuvant chemotherapy group (29/100, 29.0%), but the proportion was higher in the chemotherapy-only group (19/32, 59.4%). Regarding *BRCA* mutation status, 54/173 patients (31.2% of the total) underwent testing, and 7 patients were identified as having a *BRCA* mutation. Among the subdivided groups, the testing rate was the highest in the restaging surgery with adjuvant chemotherapy group, with 39/100 (39.0%) patients tested and 7 patients found to have *BRCA* mutations. Histologically, mucinous carcinoma was the most prevalent type (58/173, 33.5%), followed by serous carcinoma (52/173, 30.1%), clear cell carcinoma (30/173, 17.3%), and endometrioid carcinoma (24/173, 13.9%), collectively accounting for over 90% of all cases. In the restaging surgery group, the proportion of serous carcinoma was higher (42/117, 35.9%) than mucinous carcinoma (28/117, 23.9%), while in the no restaging surgery group, the proportion of serous carcinoma was lower (10/56, 17.9%) than mucinous carcinoma (30/56, 53.6%).

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Table 1. Clinicodemographic patient characteristics

Characteristics	No restaging surgery (n=56)	Restaging surgery (n=117)	Total (n=173)	p-value
Age (yr)	43.3±16.1	46.4±11.0	45.4±12.9	0.147
BMI (kg/m^2)	23.7±4.7	22.7±3.3	23.1±3.8	0.111
Parity				0.044
0	26 (46.4%)	36 (30.8%)	62 (35.8%)	
1 or more	30 (53.6%)	81 (69.2%)	111 (64.2%)	
Preoperative CA-125 (U/mL)	55.0±78.3	68.8±138.9	64.3±122.5	0.490
BRCA mutation				0.035
Wild	11 (19.6%)	36 (30.8%)	47 (27.2%)	
Mutated	0 (0.0%)	7 (6.0%)	7 (4.0%)	
Not tested	45 (80.4%)	74 (63.2%)	119 (68.8%)	
Charlson comorbidity index				0.781
0	42 (75.0%)	90 (76.9%)	132 (76.3%)	
1 or more	14 (25.0%)	27 (23.1%)	41 (23.7%)	
Initial surgery				0.002
Cystectomy	5 (8.9%)	10 (8.5%)	15 (8.7%)	
USO	28 (50.0%)	81 (69.2%)	109 (63.0%)	
BSO	7 (12.5%)	18 (15.4%)	25 (14.5%)	
TH+USO	1 (1.8%)	2 (1.7%)	3 (1.7%)	
TH+BSO	15 (26.8%)	6 (5.1%)	21 (12.1%)	
Presumed clinical stage after incomplete surgery				0.462
IA	38 (67.9%)	80 (68.4%)	118 (68.2%)	
IB	0 (0.0%)	4 (3.4%)	4 (2.3%)	
IC	16 (28.6%)	27 (23.1%)	43 (24.9%)	
II	2 (3.6%)	6 (5.1%)	8 (4.6%)	
Histology				0.006
Serous	10 (17.9%)	42 (35.9%)	52 (30.1%)	
Mucinous	30 (53.6%)	28 (23.9%)	58 (33.5%)	
Endometrioid	7 (12.5%)	17 (14.5%)	24 (13.9%)	
Clear cell	7 (12.5%)	23 (19.7%)	30 (17.3%)	
Brenner	0 (0.0%)	1 (0.9%)	1 (0.6%)	
Mixed	0 (0.0%)	4 (3.4%)	4 (2.3%)	
Neuroendocrine	1 (1.8%)	0 (0.0%)	1 (0.6%)	
Undifferentiated	1 (1.8%)	2 (1.7%)	3 (1.7%)	
Histologic grade				0.004
G1	22 (39.3%)	21 (17.9%)	43 (24.9%)	
G2	13 (23.2%)	21 (17.9%)	34 (19.7%)	
G3	14 (25.0%)	59 (50.4%)	73 (42.2%)	
Unknown	7 (12.5%)	16 (13.7%)	23 (13.3%)	

Values are presented as mean ± standard deviation or number (%).
BMI, body mass index; BSO, bilateral salpingo-oophorectomy; TH, total hysterectomy; USO, unilateral salpingo-oophorectomy.

Among the subdivided groups, serous carcinoma was more frequently observed in the restaging surgery with adjuvant chemotherapy group (37/100, 37.0%), while mucinous carcinoma was predominant in the no further treatment (14/24, 58.3%), chemotherapy-only (16/32, 50.0%), and restaging surgery-only groups (7/17, 41.2%). USO was performed during the initial surgery in 109/173 patients (63.0%) in the entire cohort, making it the most common procedure across all groups. TH with BSO was more frequently performed in the no restaging surgery group (15/56, 26.8%) compared to the restaging surgery group (6/117, 5.1%), and in subgroups, the no further treatment (7/24, 29.2%) and chemotherapy-only subgroups (8/25, 25.0%) were relatively higher rate compared to rate of other groups. The predominant presumed clinical stage after incomplete surgery was stage IA (118/173, 68.2%), followed by stage IC (43/173, 24.9%), stage II (8/173, 4.6%), and stage IB (4/173, 2.3%). This distribution was similarly observed across all groups. The pathological stages identified during restaging surgery were stage IC1 (41/117, 35.0%) and stage IA (29/117, 24.8%). The differences in the final pathological stages were statistically significant

(p=0.048) between the two subgroups that underwent restaging surgery. Additionally, 23/117 patients (19.7%) were upstaged to a more advanced stage (**Fig. S1**, **Table S2**). Most patients in the chemotherapy-treated groups (127/132, 96.2%) received paclitaxel and carboplatin as their chemotherapy regimen. There was no significant difference in the type of chemotherapy regimen used between the patient groups (p=0.640).

2. Survival outcomes

There were no significant differences in PFS (p=0.622) and OS (p=0.269) between those who did and did not undergo restaging surgery (**Fig. 2**). Further, PFS (p=0.903) and OS (p=0.696) were also not significantly different among the subgroups (**Fig. 3**). In the restaging surgery-only group, the median PFS was 105.4 months, whereas it was not reached in the other

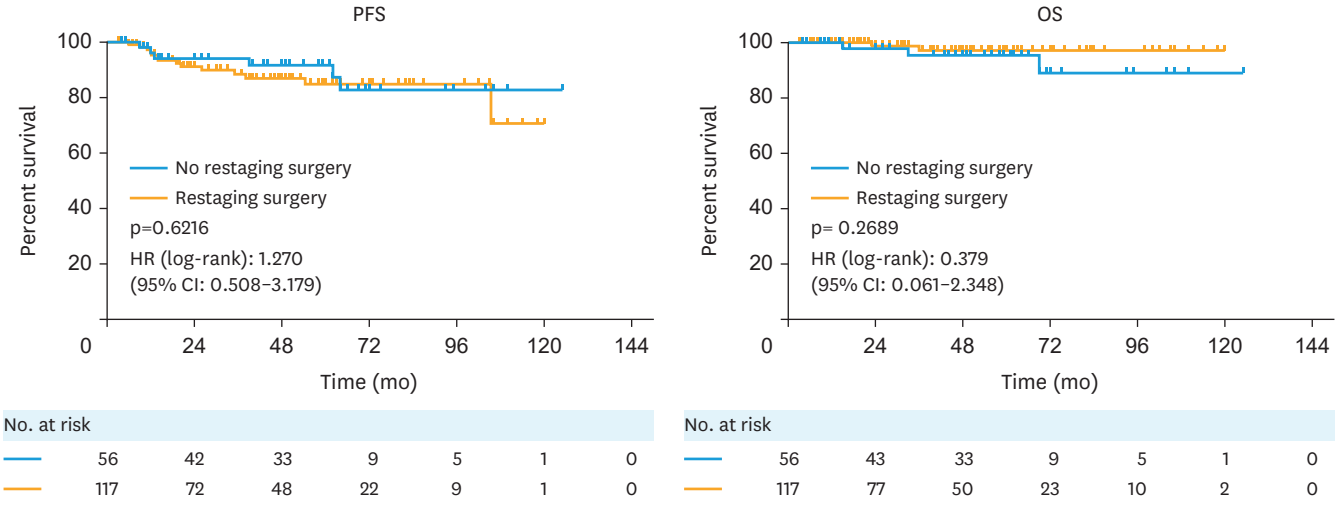

Fig. 2. PFS and OS according to treatment of restaging operation.
CI, confidence interval; HR, hazard ratio; OS, overall survival; PFS, progression-free survival.

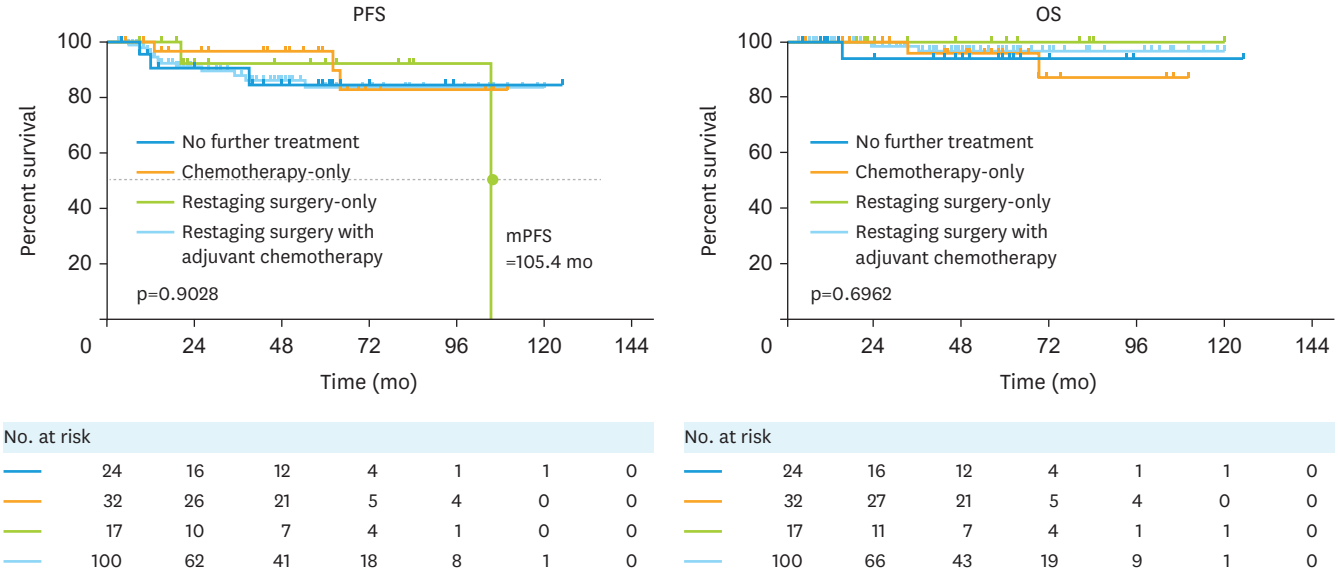

Fig. 3. PFS and OS in subgroups.
mPFS, median progression-free survival; OS, overall survival; PFS, progression-free survival.

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groups. With comparing patients based on the administration of chemotherapy, there were no significant differences in PFS (p=0.818) or OS (p=0.919) between those who received chemotherapy and those who did not (**Fig. S2**). Furthermore, among patients who received chemotherapy, no significant differences in PFS (p=0.455) or OS (p=0.412) were observed between the chemotherapy-only group and the restaging surgery with adjuvant chemotherapy group (**Fig. S3**).

In the univariate analysis, the hazard ratio (HR) for both PFS and OS showed a slight increase with increasing age, indicating a small increase in risk with advancing age (**Table 2**). However, no significant association between age and PFS was found in the multivariate analysis. In contrast, a significant difference was observed in the multivariate analysis of OS. *BRCA* mutation was a significant variable in the univariate analysis, and the significance remained in the multivariate analysis, with an HR of 2.428

Table 2. Univariate and multivariate analyses

Variable [Ref.]	PFS				OS			
	Univariate		Multivariate		Univariate		Multivariate	
	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value	HR (95% CI)	p-value
Age	1.015 (1.002–1.027)	0.019	1.011 (0.995–1.027)	0.17	1.014 (1.002–1.026)	0.02	1.012 (1.000–1.025)	0.052
BMI	0.990 (0.950–1.032)	0.651			0.999 (0.960–1.039)	0.944		
Parity [0]		0.683				0.508		
1 or more	1.072 (0.769–1.494)				1.114 (0.809–1.534)			
Preoperative CA-125	1.001 (0.999–1.002)	0.468			1.000 (0.999–1.002)	0.727		
BRCA mutation [wild]		0.177				0.023		0.187
Mutated	1.891 (0.732–4.885)				2.497 (1.104–5.644)		1.981 (0.864–4.541)	
not tested	0.844 (0.582–1.223)				0.848 (0.598–1.202)		0.935 (0.655–1.333)	
Charlson comorbidity index [0]		0.09	0.843 (0.555–1.281)	0.425		0.124		
1 or higher	1.385 (0.950–2.017)				1.322 (0.926–1.887)			
Histology (serous)		0.42				0.492		
Mucinous	0.730 (0.489–1.090)				0.740 (0.504–1.088)			
Endometrioid	0.772 (0.465–1.281)				0.793 (0.486–1.296)			
Clear–cell	0.797 (0.485–1.310)				0.896 (0.568–1.415)			
Brenner	0.793 (0.109–5.769)				0.754 (0.104–5.473)			
Mixed	0.616 (0.221–1.719)				0.608 (0.219–1.688)			
Neuroendocrine	1.379 (0.333–5.705)				1.232 (0.299–5.080)			
Undifferentiated	6.016 (0.801–45.202)				5.259 (0.705–39.215)			
Procedures used in the initial surgery [cystectomy]		0.092		0.362		0.151		
USO	1.094 (0.609–1.965)		1.094 (0.483–2.477)		1.101 (0.629–1.929)			
BSO	1.805 (0.893–3.649)		0.965 (0.569–1.635)		1.690 (0.863–3.310)			
TH+USO	3.543 (0.986–12.725)		3.223 (0.929-11.184)		3.232 (0.911–11.458)			
TH+BSO	1.375 (0.677–2.792)		1.132 (0.605–2.117)		1.341 (0.677–2.656)			
Presumed clinical stage after incomplete surgery [IA]		0.154				0.322		
IB	3.122 (0.749–13.019)				2.175 (0.681–6.947)			
IC	1.210 (0.834–1.754)				1.119 (0.781–1.602)			
II	1.819 (0.879–3.766)				1.650 (0.800–3.402)			
Histologic grade [G1]		0.015		0.038		0.012		0.055
G2	1.274 (0.736–2.204)		1.277 (0.736-2.218)		1.204 (0.718–2.019)		1.004 (0.659–1.656)	
G3	1.265 (0.703–2.276)		1.288 (0.700-2.371)		1.246 (0.723–2.148)		1.507 (1.013–2.241)	
Unknown	2.034 (1.210–3.419)		1.960 (1.157-3.321)		1.960 (1.204–3.189)		0.830 (0.493–1.396)	
Restaging operation [No]		0.623				0.288		
Yes	0.786 (0.301–2.051)				2.644 (0.441–15.863)			
Chemotherapy [No]		0.832				0.919		
Yes	1.116 (0.406–3.071)						0.893 (0.100–7.989)	

BSO, bilateral salpingo-oophorectomy; CI, confidence interval; HR, hazard ratio; OS, overall survival; PFS, progression-free survival; TH, total hysterectomy; USO, unilateral salpingo-oophorectomy.

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(confidence interval [CI]=1.074–5.493) for the mutation type (reference: wild type), and an HR of 0.885 (CI=0.623–1.257) for the untested group (p=0.04). However, as not all patients underwent BRCA testing, this result can only be compared among those who underwent testing, which presents a limitation. The Charlson comorbidity index showed higher HR for PFS in univariate analysis for values greater than 0 compared to 0 points. However, this association was not significant in the multivariate analysis. Similarly, compared to the group that underwent cystectomy as the initial surgery, other surgical procedures appeared to have differences in HRs for PFS in univariate analysis, but these differences were not significant in the multivariate analysis. Histologic grade was a significant predictor of PFS in both univariate (p=0.015) and multivariate analysis (p=0.038). Specifically, patients with higher grades (G2 and G3) had worse outcomes compared to G1. Similar to PFS, histologic grade significantly impacted OS in univariate analysis (p=0.012) and showed a trend in multivariate analysis (p=0.055). The performance of restaging surgery and the administration of adjuvant chemotherapy were not identified as independent prognostic factors for either PFS or OS.

DISCUSSION

The current treatment of choice for ovarian cancer confirmed by incomplete surgery is to establish accurate staging with a restaging surgery [4]. However, restaging is not always feasible due to patient comorbidities or individual preferences. In the present cohort, 11 patients declined restaging to preserve fertility, and 7 opted to avoid additional surgical intervention. Notably, among those who did incompletely surgically staged, treatment with chemotherapy alone resulted in survival outcomes that were non-inferior to those observed in patients who received both restaging surgery and adjuvant therapy. These findings suggest that, in the absence of radiologically evident residual disease, restaging surgery may not be essential in selected patients.

But, even the subgroup of patients who received no further treatment demonstrated non-inferior survival outcomes compared to the other groups. This observation may be attributed to the fact that 58.3% of patients in this group had mucinous histology and 87.5% were clinically presumed to have stage IA disease. Although there was no statistically significant difference in presumed clinical stage between the no restaging and restaging groups, the distribution of histologic subtypes differed between them. Therefore, it is difficult to exclude the possibility that these pathological differences contributed to the observed outcomes. However, given that histology did not show a significant impact on PFS or OS in either univariate or multivariate analysis, it is unlikely to have been the sole determinant of prognosis. Nonetheless, this limitation should be acknowledged in interpreting the findings of this study.

BRCA1/2 mutations are found in 15% of ovarian cancers [7], influencing therapeutic decisions, particularly in breast and ovarian malignancies [7,8]. In this study, patients in the restaging surgery plus adjuvant chemotherapy group exhibited a higher incidence of *BRCA* mutations, with 7 identified cases—3 known prior to incomplete surgery and four diagnosed after restaging. This elevated detection rate likely reflects a higher proportion of BRCA testing within this group. In contrast, only BRCA-negative cases were confirmed in the chemotherapy-only group. These findings suggest that awareness of BRCA status may have guided the decision toward restaging and adjuvant chemotherapy, potentially to mitigate risks associated with hereditary cancer syndromes.

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Although current imaging modalities remain limited in detecting microscopic lesions, their advancements have markedly improved diagnostic accuracy in ovarian cancer [9]. Techniques such as MRI, CT, and PET-CT have refined the evaluation of adnexal lesions and deepened understanding of tumor biology [10-12]. Radiomics derived from CT and MRI further contribute prognostic insights [13]. In this study, advanced imaging guided patient selection for incomplete surgery by confirming the absence of visible residual tumors, which may have influenced the observed outcomes.

In this study, among the 117 patients who underwent restaging surgery, 23 (19.7%) were upstaged to other main stage. Bae et al. [14] evaluated 14 patients to determine the feasibility of laparoscopic restaging surgery and found that 28.6% of the patients were upstaged. For clinically early-stage EOC, Eun et al. investigated the benefit of lymphadenectomy by comparing patients who did and did not undergo the procedure. Among the 453 patients who underwent lymphadenectomy, 13 were upstaged [15]. This finding suggests that the adjustment of the cancer stage can occur at varying rates under diverse conditions, indicating the potential multifaceted impact of lymphadenectomy in the clinical management of early-stage EOC.

Trimbos et al. [16] conducted a study on patients with early-stage ovarian cancer to evaluate the efficacy of chemotherapy in terms of recurrence-free survival (RFS) by comparing groups that underwent staging operations followed by adjuvant therapy with those that did not. They found that the group receiving adjuvant chemotherapy had better overall survival and RFS compared to the non-chemotherapy group. Conversely, our study aimed to confirm the non-inferiority of administering chemotherapy to patients with early ovarian cancer who could not undergo restaging operations. Although there are differences in the inclusion criteria between our study and the previous studies, which included only patients who had undergone staging operations, both studies emphasize the importance of adjuvant chemotherapy.

This study serves as an ancillary analysis derived from the multicenter retrospective cohort utilized in the previously published Life and Longevity After Cancer (LILAC) study, which evaluated the therapeutic and diagnostic roles of lymphadenectomy in patients with clinically early-stage EOC [15]. While the LILAC study focused on oncologic outcomes related to lymph node dissection during initial staging surgery, the present investigation addresses a different clinical context: patients with incomplete primary staging subsequently considered for restaging. This study uniquely evaluates the clinical necessity and prognostic impact of restaging surgery in patients without radiologically evident residual disease. By comparing outcomes between patients who underwent restaging versus those who did not, and further stratifying by receipt of adjuvant chemotherapy, the study explores whether restaging confers a measurable survival benefit.

To address the limitations of this retrospective analysis, a prospective trial enrolling early-stage EOC patients without radiologic evidence of residual disease after incomplete surgery—stratified by histology, grade, BRCA status, and fertility desire—could assess the safety of omitting restaging surgery in selected subgroups. Given ethical concerns with randomization, a well-adjusted observational cohort study involving patients who decline or are ineligible for restaging may serve as a practical alternative to guide individualized treatment decisions.

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Although restaging surgery led to upstaging in a subset of patients with suspected early-stage EOC who had undergone incomplete surgical staging, it did not translate into a significant survival advantage in this retrospective analysis. However, this conclusion must be interpreted cautiously due to the study's retrospective nature and limited statistical power. Thus, in patients where restaging surgery is not feasible, the administration of alternative therapies such as chemotherapy was shown to have minimal impact on prognosis. These findings provide baseline evidence for further research to establish a protocol for identifying patients who could not do restaging surgery without adversely affecting their prognosis.

SUPPLEMENTARY MATERIALS

Table S1
Clinicodemographic patient characteristics in subgroups

Table S2
Clinicopathological findings and upstaging of patients

Fig. S1
Upstaging through a restaging operation is depicted by the violet flow in the Sankey chart.

Fig. S2
Progression free survival (PFS) and overall survival (OS) according to treatment of chemotherapy.

Fig. S3
PFS and OS in chemotherapy only and restaging surgery with adjuvant chemotherapy.

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