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Neoadjuvant chemotherapy followed by interval cytoreductive surgery in patients with unresectable, advanced stage epithelial ovarian cancer: a single centre experience

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Abstract
Background Recent data has shown that the use of neoadjuvant chemotherapy (NAC) significantly reduces tumor burden before optimal cytoreductive surgery (CS) and is associated with an improved overall survival (OS). The aim of our study was to evaluate response to treatment and survival of patients with advanced epithelial ovarian cancer (EOC) who received NAC followed by interval cytoreductive surgery (ICS).
Methods Fifty-two patients with advanced EOC treated with NAC followed by ICS were retrospectively analyzed. Response to NAC, progression-free survival (PFS), and OS were evaluated. By using univariate and multivariate analyses, the predicted survival rates by the factors were analyzed.
Results Median age of patients at diagnosis were 62 years (range 33–77). The serous cell type was the most common histology (98%). The majority of patients (94%) received a combination therapy of paclitaxel and carboplatin. A median of four cycles of NAC was administered. At the end of NAC, the clinical complete response (CR) with normal clinical examination and normal serum CA 125 level was achieved in 40 patients (77%). Moreover, a radiological CR and a radiological partial response were obtained in 35 patients (67%) and in 16 patients (31%), respectively. ICS was considered standard in 45 (86%) patients. Optimal cytoreduction could be achieved in 43 of 52 patients (83%). After ICS, pathological CR was established in 15 of 52 patients (29%). At the median follow-up of 25 months (range 9–102), 2-year PFS and OS were 31 and 90%, respectively. The median PFS time was 13.3 months (SE 1.1, 95% CI 11–15) and the median OS time was 47.5 months (SE 5.8, 95% CI 36.1–59). The univariate analysis showed that optimal or suboptimal cytoreduction and perioperative blood transfusion were important prognostic factors on OS for patients who received NAC. Patients treated with optimal cytoreduction had significantly better median OS (52.5 months, 95% CI 45–60) than patients who underwent suboptimal cytoreduction (24.2 months, 95% CI 11.3–37) ($P = 0.001$). Furthermore, the cytoreduction type (optimal vs. suboptimal), surgical procedure (standard vs. non-standard), and perioperative blood transfusion were independent prognostic factors of OS by multivariate analysis ($\chi^2 = 9.28$, $P = 0.002$, HR 0.28, 95% CI 0.003–0.37; $\chi^2 = 4.44$, $P = 0.035$, HR 0.15, 95% CI 0.026–0.87; $\chi^2 = 9.24$, $P = 0.002$, HR 0.75, 95% CI 0.014–0.79, respectively).
Conclusions This study demonstrates that NAC is associated with improved OS for patients with advanced EOC who received NAC followed by ICS. Additionally, our results showed that cytoreduction type, surgical procedure, and perioperative blood transfusion were independent prognostic indicators of OS for patients with advanced EOC

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who received NAC. Thereafter, NAC may be an alternative treatment to primary cytoreduction.

Keywords Neoadjuvant chemotherapy · Advanced stage · Epithelial type · Ovarian cancer

Introduction

Epithelial ovarian cancer (EOC) is the fifth most common cause of cancer-related mortality in women [1]. Approximately, 70% of patients with EOC are diagnosed with advanced stage (stage III or IV) disease due to the nonspecific nature of its early symptoms and disease progression [2, 3]. Advanced stage EOC is a disease associated with poor prognosis, with survival rates as low as 10%, while patients with early stage disease (stage I or II) have 80–95% of survival rates [2, 4–6].

Primary cytoreductive surgery is the mainstay of treatment for EOC, followed by platinum-based adjuvant chemotherapy, if indicated. The goal of primary surgery is to remove as much tumor as possible because the amount of residual tumor is one of the most important prognostic factors for survival of women with EOC [7–9]. An optimal cytoreduction is usually defined as a removal of tumors to < 1–2 cm; however, the achievement of optimal cytoreduction is not always possible especially in some patients due to extent of disease at time of presentation, medical co-morbidities, and experience of the surgeon [10–13].

In many retrospective studies and prospecitve non-randomized trials, the beneficial effect of neoadjuvant chemotherapy (NAC) has been investigated in patients with inoperable advanced EOC or in patients with gross residual diseases that NAC may increase the number of patients suitable for interval cytoreductive surgery (ICS) [11–27]. Furthermore, these studies have shown that the use of NAC significantly reduces tumor burden before surgery and increases the percentage of patients who are subsequently able to be optimally cytoreduced. In 1995, van der Burg et al. suggested that ICS after (NAC) offers good results in patients non-optimally debulked during initial surgery compared to patients treated with chemotherapy only in a randomized study [28]. The rates of optimal cytoreduction have been reported ranging 77–94% after NAC [10, 11, 15–18, 21–23]. In this study, we aimed to evaluate response to NAC and survival rates in 52 patients with advanced EOC who received NAC followed by ICS.

Materials and methods

Totally 52 patients with histologically confirmed stage III or IV EOC, between January 2003 and December 2008, admitted to Department of Oncology, Dr Lutfi Kirdar Kartal Education and Research Hospital, were retrospectively analyzed. All patients were staged based on the International Federation of Gynecology and Obstetrics staging system (FIGO). The patients were identified as poor optimal cytoreductive surgery candidates due to medical co-morbidities, extra-abdominal disease or non-optimally cytoreducible intra-abdominal disease. Non-optimally cytoreducible intra-abdominal disease was defined according to CT findings. Radiological criteria were described as follows: the omentum replaced by tumor that extends to the spleen and presence of large omental caking, diffuse peritoneal deposits or disease greater than 2 cm on the diaphragm, liver surface or parenchyma, pleura, mesentery, gallbladder fossa or suprarenal para-aortic lymph nodes [19].

The patients who underwent an attempt at cytoreduction before chemotherapy were not included in this study. The clinical information such as age at diagnosis, method of diagnosis, indication and type of NAC, number of chemotherapy cycles administered, imaging study finding, initial and post-treatment serum CA-125 levels, surgical procedure (standard or non-standard), cytoreduction type (optimal or suboptimal), the status of perioperative blood transfusion, and the length of hospitalization were obtained from the patients' charts. In all eligible patients, physical examination and comprehensive imaging evaluations of the abdomen and pelvis were made and the diagnosis confirmed for advanced EOC by diagnostic imaging, ascitic or pleural fluid cytology, peritoneal or omental biopsy by laparotomy or laparoscopy [29, 30] and CA-125 levels. Standard cytoreductive surgery was defined as a procedure including a total abdominal hysterectomy, bilateral salpingo-oophorectomy, total infra-gastric omentectomy, appendectomy, and peritoneal debulking after NAC. Optimal cytoreduction was considered to be achieved when the residual disease was < 1 cm in size [21, 23, 26].

Neoadjuvant chemotherapy was defined as platinum-based chemotherapy administered prior to primary cytoreductive surgery. Forty-nine out of 52 patients were treated with platinum-/taxane-based NAC. On the other hand, two patients received cisplatin and cyclophosphamide, while one received cisplatin, cyclophosphamide, and epirubicine. All chemotherapy regimens were given by intravenous route. All histopathological specimens after surgery were evaluated comparing with initial slides at diagnosis by the same gynecologic pathologist.

The response to NAC was assessed by physical examination, the serum CA-125 levels and comparison of CT findings prior to and after the completion of NAC. Responses of the patients were evaluated using RECIST criteria. A complete response (CR) was defined as the disappearance of all measurable disease, a partial response (PR) represented a decrease of at least 30% of the tumor

volume and stable disease (SD) defined small changes that do not meet above criteria without actual progression of disease. Progressive disease (PD) was defined as more than 20% increase in tumor volume or any new sites of disease. After ICS, the absence of findings related to malignancy in histopathological examination of the specimen was accepted as a pathologic CR. Informed written consent was obtained from each subject included in the study.

Statistical analysis

Statistical analyses were performed using SPSS 13.0 (SPSS Inc., Chicago, IL, USA) software. Descriptions of the parameters are quoted as mean ± SD and 95% confidence interval (CI). Progression-free survival (PFS) and overall survival (OS) times were estimated using the Kaplan–Meier method. PFS was defined as the time from ICS to disease progression or to the date of death or last known contact. In addition, OS was described as the time from diagnosis to the date of the patient's death or last known contact. The univariate and multivariate analyses of prognostic factors related to survival were performed by the Cox proportional hazards model. Multivariate *P* values were used to characterize the independence of these factors. The 95% CI was used to quantify the relationship between survival time and each independent factor. The *P* values less than or equal to 0.05 were considered to be statistically significant.

Results

From January 2003 to December 2008, 52 patients with advanced EOC were retrospectively analyzed; median age was 62 years (range 33–77) at diagnosis. Twenty-five patients were less than 60 years (48%). The majority of patients were stage IIIC (51 patients, 98%) and over the 81% of patients were diagnosed by peritoneal or omental biopsy, which was performed during laparotomy or laparoscopy. In the remaining 10 patients, an ascitic (17%) and pleural (2%) fluids cytologies were used for diagnosis. The serous cell type was the most common histological type (77%). In addition, 46% of patients were presented with histologic grade 3 disease, others had grade 1 or 2. There were 44 patients (84%) who had good performance status (ECOG PS: 0–1), and the remaining eight patients had poor PS (ECOG PS: 2). Main baseline characteristics of patients are shown in Table 1.

Neoadjuvant chemotherapy was preferred in 51 patients (98%) with non-optimally cytoreducible intra-abdominal disease and in only one patient because of extra-abdominal disease. The median number of NAC cycles administered was 4 (range of 3–4). Twenty-eight patients (61%) received four courses of NAC. However, others received three cycles of NAC before ICS. The number of cycles was determined according to the evidence of stabilization or progression of disease, response to CA 125, patient's inability to tolerate NAC or the presence of finding related to malignancy, after surgery.

Table 1 Characteristics of baseline patients

Characteristics	*n* = 52 (%)
Median age (range)	62 (33–77)
Median follow-up (months, range)	25 (9–102)
FIGO stage	
IIIC	51 (98)
IV	1 (2)
Histology	
Serous	40 (77)
Endometrioid	2 (4)
Mucinous	5 (9)
Clear cell	2 (4)
Carcinosarcoma	1 (2)
Other	2 (4)
Histologic grade	
1	5 (10)
2	23 (44)
3	25 (46)
ECOG PS	
0	9 (17)
1	35 (67)
2	8 (16)
Method of diagnosis	
Exploratory laparotomy or laparoscopy with biopsy only	42 (81)
Ascitic fluid cytology	9 (17)
Pleural fluid cytology	1 (2)
Pre-treatment CA 125 level (U/ml, median)	776 (49.2–12,130)
Post-neoadjuvant chemotherapy CA 125 level (U/ml, median)	17.9 (4.8–183)

ECOG PS Eastern Cooperative Oncology Group performance status

The majority of patients (49 patients, 94%) received a combination therapy of paclitaxel and carboplatin (PC). While there were two patients who received the combination chemotherapy of cisplatin and cyclophosphamide, and only one patient received the combination of cisplatin, cyclophosphamide, and epirubicine. Only seven patients (14%) suffered from grade 3 to 4 toxicities (one anemia, two neutropenia, one neutropenia–thrombocytopenia, one nausea—vomiting, and two neuropathy).

Following NAC, we found a statistically significant decrease from pre-treatment median CA 125 levels (776 U/ml; range 49.2–12,130) to median post-NAC levels (17.9 U/ml; range 4.8–183) ($P = 0.01$). Forty-three of the

52 patients (83%) achieved at least a 50% decrease in their CA 125 levels compared with baseline values. Furthermore, a clinical CR with normal clinical examination and serum CA 125 level was also obtained in 40 patients (77%). On the other hand, after radiographic survey of the 52 patients at the end of NAC revealed 35 patients (67%) with a radiological CR (rCR), 16 patients (31%) with a radiological PR (rPR), and only one patient with SD (2%).

All patients underwent ICS, which was a standard surgery in 45 patients (86%) and non-standard surgery in 7 patients (14%). Moreover, an optimal cytoreduction was also achieved in 83% of patients, while suboptimal cytoreduction was obtained in 9 patients (17%). The lymph node sampling could be performed in 50% of patients and lymph node metastasis was detected in 7 patients (13.5%). The median lenght of hospitalization after ICS was 13 days (range 6–32). Thirty-five patients (67%) received perioperative blood transfusion. The median OS time was lower in patients with received perioperative blood transfusion than those with non-treated transfusion (36.6 vs. 52.5 months), and this difference was significant ($P = 0.014$). After ICS, pathological CR was achieved in 15 patients (29%). The response rates of patients who received NAC after surgery are listed in Table 2. All patients with pCR underwent an optimal ICS at the time of surgery. A median of four cycles of adjuvant chemotherapy (two to six cycles) was administered. Over the 82% of patients received a combination of taxane (paclitaxel or docetaxel) and platinum (cisplatin or carboplatin)-based regimen in adjuvant setting.

At the median follow-up of 25 months (range 9–102), 2-year PFS and OS were 31 and 90%, respectively. The median PFS time was 13.3 months (SE 1.1, 95% CI 11–15) and the median OS time was 47.5 months (SE 5.8, 95% CI 36.1–59) (Figs. 1, 2). In addition, the median PFS interval was 14.3 in patients with optimal cytoreduction and 10.2 months in suboptimal group [(SE 2.1, 95% CI 10–18.5) and (SE 3.4, 95% CI 3.4–16.9), respectively].

The univariate analysis showed that optimal or suboptimal cytoreduction and perioperative blood transfusion were important prognostic factors on OS for patients who received NAC. There were no significant differences with respect to PFS between optimal and suboptimal groups ($P = 0.08$) (Fig. 3). However, 2-year OS was statistically different in these groups (93 vs. 38%, $P = 0.001$). The median OS time was 52.5 months in patients who underwent optimal cytoreduction (SE 3.8, 95% CI 45–60), while in suboptimal group, the median OS was 24.2 months (SE 6.1, 95% CI 11.3–37) (Fig. 4). However, the significant difference was not detected for both PFS and OS according to age, grade, histology, PS, surgical procedure, and radiological and pathological response rates by univariate analysis ($P > 0.05$). The results of univariate analysis are listed in Table 3.

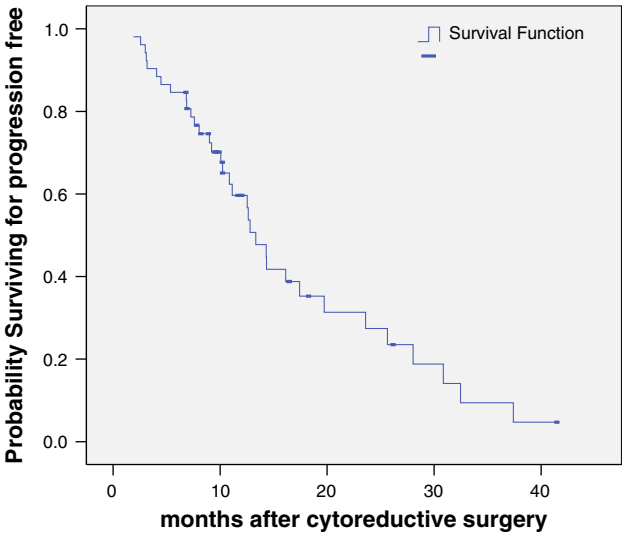

Fig. 1 PFS after neoadjuvant chemotherapy followed by interval surgical cytoreduction in advanced epithelial ovarian cancer

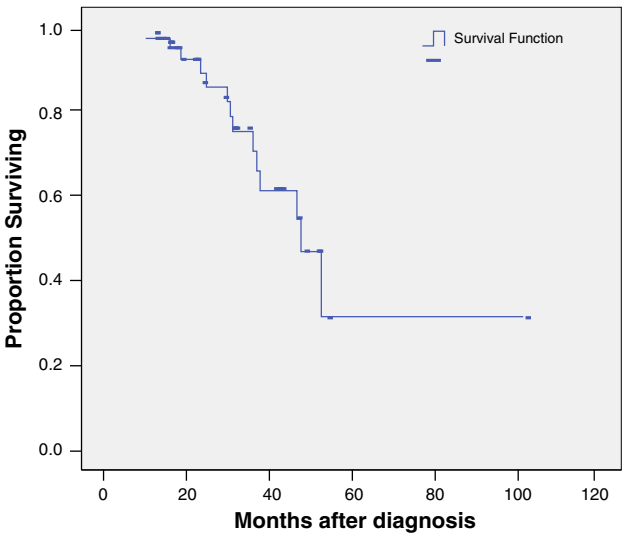

Fig. 2 Overall survival after neoadjuvant chemotherapy followed by interval surgical cytoreduction in advanced epithelial ovarian cancer

Table 2 Response rates in patients with advanced EOC who received NAC

Response rate	*n* (%)
Clinical CR	40 (77)
Radiological CR	35 (67)
Radiological PR	16 (31)
Radiological SD	1 (2)
Pathological CR	15 (29)
Pathological PR	37 (71)

CR complete response, *PR* partial response, *SD* stable disease, *EOC* epitelial ovarian cancer, *NAC* neoadjuvant chemotherapy

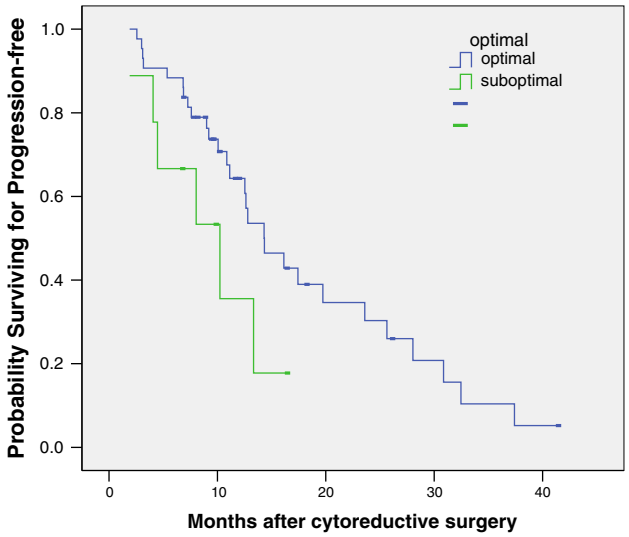

Fig. 3 PFS in patients treated with optimal and suboptimal cytoreductions

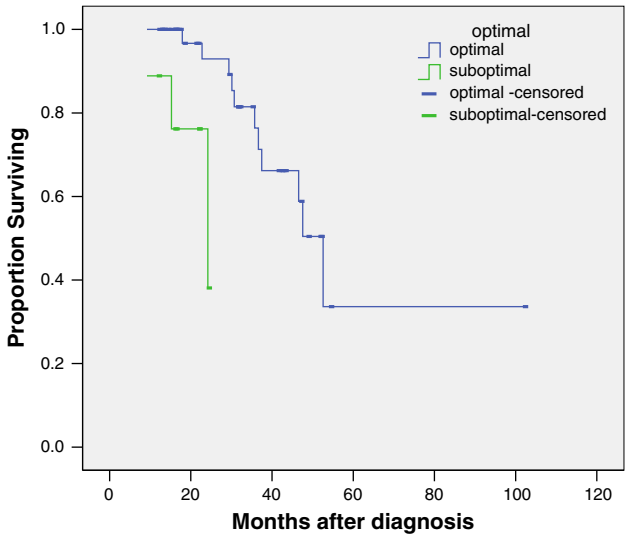

Fig. 4 The overall survival rate in patients treated with optimal and suboptimal cytoreductions

We performed multivariate analysis with Cox proportional hazards model for the factors which had *P* values less than 0.5, in order to further evaluate the prognostic significance of these factors. Multivariate analysis indicates that cytoreduction type (optimal vs. suboptimal), surgical procedure (standard vs. non-standard), and perioperative blood transfusion were independent prognostic factors for survival ($\chi^2 = 9.28$, $P = 0.002$, HR 0.28, 95% CI 0.003–0.37; $\chi^2 = 4.44$, $P = 0.035$, HR 0.15, 95% CI 0.026–0.87; $\chi^2 = 9.24$, $P = 0.002$, HR 0.75, 95% CI 0.014–0.79, respectively). Table 4 shows the results of multivariate analysis.

Discussion

The majority of patients with EOC are diagnosed in their advanced stage as extraovarian metastasis, resulting in poor prognosis and high mortality [3, 4, 6]. The standard treatment of these patients with advanced EOC commonly included optimal surgical debulking to optimize the size of residual tumor followed by platinum-based adjuvant chemotherapy, if indicated [7–9]. The strongest prognostic factor is the presence of and size of residual tumor at the end of the initial surgery. The aim of the surgical procedure is to obtain the most complete tumor resection [10–13, 31, 32]. An optimal cytoreduction, which is usually defined as the removal of tumors to < 1–2 cm, however, the achievement of such cytoreduction is not always possible especially in some patients because of extent of disease at time of presentation, medical co-morbidities, and experience of the surgeon [7–13, 21, 23]. On the other hand, optimal debulking is achievable in only 77–94% of patients with advanced stage EOC in spite of advancements in surgical techniques [10, 11, 15–18, 21–23, 33]. In our study, optimal cytoreduction rate was 83%, which is similar to that reported in the literature.

After aggressive cytoreductive surgery, significant postoperative morbidities and mortalities can occur which result in delays of adjuvant chemotherapy [31, 32]. NAC followed by ICS has been largely investigated as a possible alternative to standard surgery in women with important medical co-morbidities causing them unable to tolerate cytoreductive surgery and it is associated with apparent equivalent outcomes with lesser anticipated complications and shorter hospitalization postoperatively [14, 15, 18–20, 23, 25]. Moreover, recent studies suggested that NAC significantly reduced tumor burden before surgery and increased the feasibility of optimal cytoreduction at the time of surgery in advanced EOC [11, 21, 23, 25, 27]. Bristow et al. recently suggested that there was a significant relationship between the percent of maximal cytoreduction and the median survival time in their meta-analysis [9].

van der Burg et al. [28] showed significantly longer survival rate in ICS group which was still present after a 10-year follow-up [34]. However, two trials indicated similar survival rates of patients between the ICS and conventional treatments [35, 36]. Kuhn et al. reported significantly longer survival of patients who received NAC followed by ICS in their retrospective studies. No differences in perioperative morbidity or post-operative complication rates were found in their study [21]. Furthermore, in other retrospective tiral, Vergote et al. also suggested a higher 3-year survival and a lower post-operative mortality rate in NAC patients [27]. On the other hand, Fanfani et al. showed inferior results of ICS than optimal primary cytoreduction, although NAC followed by successful ICS could achieve

Table 3 Overall survival and disease-free survival univariate analysis according to clinico-pathological factors

Factors	*n* (%)	PFS (%)	Median PFS (months)	*P*	OS (%)	Median OS (months)	*P*
Age							
≤ 60	25 (48)	24	12.8	0.56	96	NR	0.21
> 60	27 (52)	30	14.3		80	46.5	
Grade							
1–2	28 (54)	27	14.3	0.46	92	37.4	0.75
3	24 (46)	34	13.3		83	52.5	
Histology							
Serous	40 (77)	32	12.8	0.33	89	47.5	0.76
Non-serous	12 (23)	31	16.1		91	NR	
PS							
0–1	44 (85)	29	12.8	0.49	88	NR	0.49
2	8 (15)	47	17.4		80	47.5	
Surgery type							
Standard	45 (86)	3	13.3	0.41	91	47.5	0.30
Non-standard	7 (13)	36	19.7		80	37	
Cytoreduction							
Optimal	43 (83)	30	14.3	0.08	93	52.5	0.001
Suboptimal	9 (17)	NA	10.2		38	24.2	
Blood transfusion							
Absent	17 (33)	27	14.3	0.86	91	52.5	0.014
Present	35 (67)	25	12.6		76	35.7	
Radiological response							
CR	35 (67)	23	14.3	0.98	87	46.5	0.50
PR, SD	17 (33)	35	12.6		85	47.5	
Pathological response							
CR	15 (29)	33	14.3	0.69	87	46.5	0.98
PR	37 (71)	24	12.8		85	52.5	

PS performance status, *PFS (%)* progression-free survival rate, *OS (%)* overall survival rate, *CR* complete response, *PR* partial response, *SD* stable disease, *NA* not applicable, *NR* not reached

Table 4 Multivariate analysis of various clinicopathological factors in patients with advanced EOC who received NAC

Factors	Wald	*P*	HR	95% CI
Age (≤ 60 vs. > 60)	0.55	0.45	1.71	0.41–7.1
PS (0–1 vs. 2)	1.90	0.16	0.35	0.08–1.54
Surgery type (standard vs. non-standard)	4.44	0.035	0.15	0.02–0.87
Cytoreduction (optimal vs. suboptimal)	9.28	0.002	0.28	0.003–0.37
Blood transfusion (absent vs. present)	9.24	0.002	0.75	0.014–0.79

HR Hazards ratio, *CI* confidence interval, *CR* complete response, *PR* partial response, *SD* stable disease

good results in terms of survival outcomes [37]. Kayikçioglu et al. [26] and Onnis et al. [38] demonstrated higher cytoreduction rates, but not improved OS in patients treating with NAC. However, Lee et al. showed no improvement in survival, but less morbidity in patients who received NAC [25].

Recently, in EORTC-GCG/NCIC-CTG randomized trial carried out by Vergote et al., they suggested that NAC followed by debulking surgery produces similar OS and outcomes compared to standard primary debulking in stages IIIC–IV ovarian, fallopian tube, and peritoneal cancer. Thereafter, they concluded that due to the lower morbidity of ICS compared with primary surgery debulking, NAC can be considered as the preferred treatment [39].

Previous studies have reported that the response rate was 70–80% in advanced EOC with an acceptable toxicity profile in NAC [14, 20, 27]. In our study, all patients could complete and tolerate planned NAC with appropriate toxicity. Clinical CR was detected in 40 patients (77%). In addition, objective radiological response was obtained in 98% of patients, with 67% of patients having rCR and 31% of patients showing rPR. However, pathological CR was also detected in 29% of patients. All patients with pathological CR underwent optimal cytoreductive surgery. Our results were compatible with the literature.

The pre-treatment median CA 125 level significantly decreased compared with median post-NAC levels ($P = 0.01$).

We found a high response rate (83%) to NAC based on CA 125 criteria. Our results were also similar to responses often reported in patients treated with initial debulking surgery followed by adjuvant chemotherapy.

In patients with advanced stage EOC, treated with primary surgical debulking followed by adjuvant chemotherapy, the survival rate ranges from 5 to 25% [3, 4, 6]. The results of EORTC trial showed that using NAC might lead to an improvement in OS and PFS [40]. Hou et al. in their recent studies reported a similar median OS (46 months) and PFS (16 months) in NAC patients compared with patients treated with primary debulking surgery (47 and 14 months, respectively) [19]. In addition, they also demonstrated that NAC is associated with less perioperative morbidity and is in less need for further aggressive surgery.

In the current study, 2-year PFS and OS were 31 and 90%, respectively, at the median follow-up of 25 months with a median PFS interval of 13.3 months and a median OS time of 47.5 months. Although our PFS is less than that in previous studies, the rate of OS and median OS interval were compatible with the literature [14, 20, 21, 27, 40]. The reason for this difference in PFS may be related to the small sample size in our study.

In univariate analysis, an optimal or suboptimal cytoreduction and perioperative blood transfusion were detected as important prognostic factors on OS for patients who received NAC. The patients who received perioperative blood transfusion had significantly less median survival time than those who did not receive that by univariate analysis ($P = 0.014$). Lee et al. reported that younger age was a significant predictive variable after NAC [25]. Kuhn et al. reported that residual tumor, age, ascites volume, lymph node status and grading were prognostic factors by univariate and multivaritate analyses [21]. On the other hand, although in one meta-analysis, the association of PS with survival has been suggested [41], this effect could not be documented in our study. Rafii et al. showed that PS, ascites, and surgery were independent prognostic factors in their retrospective study [42]. In addition, they reported lower optimal cytoreduction rate and no survival advantage. In our study, patients treated with optimal cytoreduction had significantly better median OS than patients who had suboptimal cytoreduction (52.5 vs. 24.2 months, respectively, $P = 0.001$). Our results were correlated with previous reports [43, 44].

Multivariate analysis showed that cytoreduction type (optimal vs. suboptimal), surgical procedure (standard vs. non-standard), and perioperative blood transfusion were independent prognostic factors for OS in our study. Morice et al. reported that there were significant differences according to blood transfusion in ICS group compared to primary debulking surgery groups [24].

Taxane- and platinum-based chemotherapy is a standard first-line adjuvant treatment for EOC. The combination of paclitaxel and carboplatin (PC) was accepted to be as effective as paclitaxel and cisplatin individually, and is associated with less chemotherapy-induced morbidity [2]. The effects of different NAC regimens have not been compared previously except for the study of Hou et al. They showed a superior OS with PC when compared with carboplatin/cyclophosphamide [16]. Recently, Pignati et al. reported that the combination of pegylated liposomal doxorubicin and carboplatin demonstrated activity as a first-line treatment for advanced EOC [45]. In our study, the majority of patients (94.2%) received PC.

In conclusion, improved OS were obtained with acceptable toxicity profile for patients with advanced EOC who received NAC followed by ICS in our study. Our results showed that cytoreduction type, surgical procedure, and perioperative blood transfusion were independent prognostic indicators of OS for patients with advanced EOC who received NAC. The NAC may be an alternative treatment to primary debulking surgery as feasible and promising approach in patients with advanced EOC, who were poor optimal cytoreductive surgery candidates, due to medical co-morbidities, extra-abdominal disease or non-optimally cytoreducible intra-abdominal disease.

Acknowledgments This study was presented as a poster in the 12th Biennial Meeting International Gynecologic Cancer Society 2008. Bilici A, Salepci T, Oven B, Seker M, Salman T, Gumus M, Yaylaci M, Turan C, Unal O, Kars B. Neoadjuvant chemotherapy followed by surgical cytoreduction in advanced epithelial ovarian cancer: a single center experience. IGCS, 2008 (abstr 386).

Conflict of interest statment None.

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