Prognostic factors for types I and II epithelial ovarian cancer in the elderly

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Summary

**Purpose:** No consensus exists on whether age is independently associated with poor prognosis in epithelial ovarian cancer (EOC). This study aimed to examine the prognostic factors of EOC in elderly patients. **Materials and Methods:** A total of 665 EOC patients from Jiangsu Institute of Cancer Research (JICR, People’s Republic of China) were retrospectively analyzed between 1996 and 2015. For validation, 990 cases who consulted at MD Anderson Cancer Center (MDACC, USA) from 1990 to 2011 were recruited. The associations between survival durations and covariates were assessed by Cox proportional hazards model and log-rank test. **Results:** Histological type II \((p = 0.01)\) and suboptimal surgery outcome \((p = 0.00)\) were more common in the elderly \((\text{age} \geq 70\) years\) patients with EOC than in younger patients from JICR. The International Federation of Gynecology and Obstetrics (FIGO) stage, histological type, and optimal surgery were independently associated with overall survival \((\text{OS}; p = 0.00, p = 0.03, \text{and} p = 0.00, \text{respectively})\) and progression-free survival \((\text{PFS}; p = 0.00, p = 0.02, \text{and} p = 0.00, \text{respectively})\) in the EOC patients. Both OS and PFS were lower in the elderly patients with type I EOC than in the younger cases \((136.5 \text{ months vs. 191.8 months at} p = 0.00 \text{ and 35.5 months vs. 75.1 months at} p = 0.01, \text{respectively})\). The OS and PFS of the elderly patients were poorer than those of the younger cases with type II EOC \((38.4 \text{ months vs. 42.3 months at} p = 0.00 \text{ and 14.9 months vs. 16.8 months,} p = 0.04, \text{respectively})\). In type II ovarian cancer patients who achieved optimal debulking, the median OS and PFS durations of younger patients remained longer than those of elderly patients \((50.2 \text{ months vs. 68.0 months,} p = 0.00 \text{ and 14.9 months vs. 19.2 months,} p = 0.01, \text{respectively})\). **Conclusions:** Compared with young patients, elderly EOC more commonly presented with an aggressive histological type and poor performance status and was more frequently undertreated. Advanced age was independently associated with poor prognosis in EOC, even after the influence of histological type and surgical outcome was eliminated.

**Key words:** Epithelial ovarian cancer; Prognostic factors; Advanced age.

Introduction

Epithelial ovarian cancer (EOC) is the leading cause of death from gynecologic malignancies in the United States and Europe \([1–3]\). Approximately 41,000 cases and an estimated 27,000 women die from this disease every year in China \([4]\). The peak incidence of EOC is over 70 years of age, and these elderly patients account for approximately two-thirds of cancer-related deaths \([5–9]\). With the improvement in population age and life expectancy, the increasing number of patients has altered the demographics of EOC. Therefore, age-oriented factors related to prognosis in ovarian cancer should be determined \([10, 11]\).

At present, the standard care for patients with advanced stage EOC is maximal surgical debulking to achieve complete tumor resection and six to eight cycles of systemic adjuvant administration every three weeks. Over the past decades, chemotherapy regimens have evolved from cyclophosphamide-based regimens to a combination regimen of carboplatin plus paclitaxel. With the improvement of surgery and chemotherapy, the mortality rate of ovarian cancer has continuously decreased, but the age-specific mortality rate has increased in the elderly population. Elderly patients are at an increased risk of death by at least twofold, although its independence remains controversial and related mechanisms are unclear \([12–15]\).

Several hypotheses have been proposed to explain this survival disparity in elderly patients with EOC. Elderly ovarian cancer was demonstrated to be of aggressive historical subtype, advanced International Federation of Gynecology and Obstetrics (FIGO) stage, and inherent drug resistance. The poor prognosis of elderly patients with EOC was biased by the skewed distribution of these characteristics \([16–22]\). Moreover, management biases toward the elderly patients with more adverse concurrent medical problems \([23]\) may lead to more suboptimal surgery \([24–26]\); inadequate chemotherapy, including delay, and dose reduction \([27–28]\), and lower enrollment in clinical trials. In
other studies, elderly patients with EOC were found likely to receive a more conservative therapeutic approach than aggressive standard care, merely due to physician bias and/or patient’s choice-related quality of life [14, 29–30]. However, studies emphasized that elderly patients with EOC successfully tolerated a standard approach with few side effects when adjusted for performance status [31–34]. Other studies found that elderly patients with EOC who underwent standard primary therapy achieved similar survival durations to those of younger patients. Recent studies suggested that ovarian cancers can be regrouped into two broad categories, namely, types I and II, on the basis of clinico-pathological and genetic features. Type I ovarian cancers present in youth, grow slowly, and respond less frequently to platinum-based therapy than do type II ovarian cancers. By contrast, type II ovarian cancers present in the elderly, grow aggressively, and are responsible for 90% of ovarian cancer deaths but respond to platinum-based therapy.

Currently, no prospective trial that used age as variable has addressed whether age affects the prognosis of EOC patients. Most of the retrospective works that have explored this issue have applied distinct recruitment standards that varied from one another in clinical features and may have influenced prognosis. This study aimed to explore the prognosis-associated factors or management differences related to age in a cancer institute from China and a major cancer center from the USA in elderly patients with EOC. In the present study, the authors compared the prognostic significance of age in types I and II ovarian cancers at Jiangsu Institute of Cancer Research (JICR) and the University of Texas MD Anderson Cancer Center (MDACC). They then determined whether age is predictive of the survival duration of patients with type I and II tumors.

**Materials and Methods**

This retrospective study was approved by the institutional review board of Jiangsu Cancer Hospital, Nanjing Medical University, China. The informed consent requirement was waived. The committee’s reference number was Nanjing Medical University Ethical Committee 2017-405.

In this retrospective study, chart review was conducted to identify 665 EOC patients treated at JICR, China from January 1, 1996 to December 31, 2015 as listed in Table 1. Meanwhile, 990 patients with EOC from MDACC, USA were recruited between January 1, 1990, and February 14, 2011 for validation (Table 2). A total of 136 elderly (≥ 70 years) patients were recruited from JICR and 191 elderly cases from MDACC. A multidisciplinary team (MDT), which consisted of gynecologic oncologists, pathologists,
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Radiologists, and medical oncologists, was assigned to guide clinical management in JICR. The recruit criteria for the present study were as follows: histologically confirmed ovarian, fallopian-tube, or peritoneal epithelial cancer by primary surgery procedure or core biopsy. Therapy procedure included primary debulking surgery and a standard doublet chemotherapy regime composed of carboplatinum (area under the curve 5–6) and paclitaxel (135–175 mg/m²) administered every three weeks. Neoadjuvant chemotherapy (NAC) followed by interval cytoreduction surgery (IDS) was the alternative primary therapy procedure. Low likelihood of achieving optimal cytoreduction or high perioperative risk profile was the major consideration for NAC. The optimal number of NAC and adjuvant chemotherapy, as well as the optimal time of IDS, was determined by the MDT. The follow-up plan included radiological assessment and a series of serum marker measurements after primary treatment completion as mentioned previously [16, 18–19].

The following clinicopathologic characteristics and clinical-management-related factors of the recruited patients were reviewed: age, histological subtype, FIGO Stage, series of serum tumor markers, including CA-125, CEA, and HE4, at the time points of initial diagnosis, before and after surgery, before and after chemotherapy and follow-up, serum content (Hb) content and albumin content, performance status, comorbidities and postoperative complications, chemotherapy regime and courses, radiological or pathological responses to treatment, surgery outcome, and disease status at the last follow up. All operations were performed by a gynecologic oncologist leading a comprehensive surgery team composed of colorectal, urologic, thoracic, and hepatobiliary surgeons. Standard cytoreductive procedures included hysterectomy, oophorectomy, lymphadenectomy, appendectomy, and omentectomy. The application of more comprehensive surgical methods targeting upper abdominal disease has been proven to improve optimal cytoreduction rates and survival durations. The present authors’ surgical approach incorporated the use of extensive upper abdominal surgery (EUAS). EUAS is defined as splenectomy, diaphragm stripping, and/or resection, distal pancreatectomy, partial gastrectomy, partial liver resection, and tumor resection from the porta hepatitis (Table 3).

The Eastern cooperative oncology group performance status (ECOG PS), perioperative comorbidity, and postoperative complications of recruited patients are also listed in Table 3. Ascites volume was estimated by ultrasound at the time of initial diagnosis. Ascites regression after NAC was defined by as an ascites volume < 500 mL. CA-125 decreasing kinetics was defined as the ratio of the baseline serum CA-125 level divided by the preoperative serum CA-125 level. The surgical pathologic staging of patients was in accordance with the FIGO stage system. Optimal debulking was defined as the absence of macroscopic disease after surgical procedure. Overall survival (OS) was defined as the length of time from disease diagnosis to death or until the last follow-up examination. Progression-free survival (PFS) was defined as the time to a specified recurrence from the last day of preceding treatment.

After primary treatment, patients were scheduled for CT)/MRI

### Table 2. — Clinicopathologic characteristics of epithelial ovarian cancer from MDACC.

| Characteristic                              | ≥ 70 years, n (%) | < 70 years, n (%) | p*   |
|---------------------------------------------|------------------|------------------|------|
| Baseline Hb (g/mL, mean, SD)                | 115.6 (15.1)     | 126.8 (17.1)     | 0.88 |
| Baseline CA-125 (U/mL, mean, range)        | 930 (7-32900)    | 810 (7-33500)    | 0.90 |
| Baseline albumin (g/dL, mean, SD)          | 37.5 (7.06)      | 39.8 (7.48)      | 0.63 |
| Body Mass Index (mean SD)                  | 26.4 (4.67)      | 27.4 (6.89)      | 0.02 |
| **Histology**                              |                  |                  |      |
| Low-grade serous                           | 7 (3.7)          | 62 (7.8)         | 0.03 |
| Low-grade endometrioid                     | 5 (2.6)          | 32 (4.0)         |      |
| Clear cell                                 | 2 (1.0)          | 32 (4.0)         |      |
| Mucinous                                   | 4 (2.1)          | 16 (2.0)         |      |
| Transitional                               | 5 (2.6)          | 9 (1.1)          |      |
| High-grade serous                          | 146 (76.4)       | 560 (70.1)       |      |
| High-grade endometrioid                    | 10 (5.2)         | 36 (4.5)         |      |
| Undifferentiated                           | 6 (3.1)          | 27 (3.4)         |      |
| **FIGO Stage**                             |                  |                  |      |
| I                                           | 9 (4.7)          | 66 (8.3)         | 0.38 |
| II                                          | 13 (6.8)         | 45 (5.6)         |      |
| III                                         | 129 (67.5)       | 524 (65.6)       |      |
| IV                                          | 40 (20.9)        | 158 (19.8)       |      |
| Unknown                                     | 0 (0.0)          | 6 (0.1)          |      |
| **Ascites volume (mL)**                    |                  |                  |      |
| ≥ 500                                       | 65 (34.0)        | 205 (25.7)       | 0.01 |
| < 500                                       | 105 (55.0)       | 543 (68.0)       |      |
| Unknown                                     | 21 (11.0)        | 31 (3.9)         |      |
| **HIC staining**                           |                  |                  |      |
| TP53 (+)                                    | 65/76 (85.6)     | 172/220 (78.2)   | 0.22 |
| Ki67 (>10%)                                 | 60/68 (88.2)     | 158/204 (77.5)   | 0.08 |
| CA-125 (+)                                  |                  |                  |      |
| ER (+)                                      |                  |                  |      |
| PR (+)                                      |                  |                  |      |

p*, Chi-square p-value. Baseline*, level at diagnosis. HIC staining*, available in partial cases. FIGO*, the International Federation of Gynecology and Obstetrics.
or positron emission tomography imaging (PET/CT) of the abdomen and pelvis every three months with clinical evaluation. Response to treatment was evaluated by the RECIST v1.1 criteria and documented as a complete response, partial response (greater than 30% decrease in the longest axis), progressive disease (greater than 20% increase in the longest axis), or stable disease (neither partial response nor progressive disease) [35]. The pathologic diagnosis of all specimens was reconfirmed by pathologists (Hou, Qu, and Xu). Pathologic markers such as TP53, Ki67, CA-125, ER, and PR expression were detected by routine immunohistochemistry labeling. Informed consent was obtained in all cases, and protocols were approved by the scientific ethical committees of both JICR and MDACC.

Data manipulation and statistical analysis were performed by SPSS software v16. Descriptive statistical values included mean ± standard deviation values for continuous data and percentages for categorical data. Differences in the clinicopathologic characteristics and clinical-management-related factors among subgroups were evaluated using the Student t-test, and t-test was used for categorical variables, such as immunostaining results. The association of survival with age, FIGO Stage, histological type, baseline CA-125 levels, ascite regression, or NAC and surgery outcomes was assessed by Cox proportional hazards model. A multivariate model was constructed by stepwise regression techniques. Survival distributions were estimated by the Kaplan–Meier method, and statistical significance was determined by log-rank test. In all cases, p-value < 0.05 was considered statistically significant.

### Results

The median Hb content, albumin content, and baseline CA-125 level in the elderly patients did not differ from those of the younger cases in both JICR and MDACC populations. The mean body mass index was comparatively lower in the elderly patients from both centers. The histological type II tumor was more common in the elderly group in both populations. The median follow-up duration of the survivors was 46.6 months (interquartile range, 38.2 months to 57.4 months) in JICR.

The ECOG performance status ≥ 1 and comorbidities ≥ 2 were more common in the elderly patients than in the younger cases from the JICR (p = 0.00, p = 0.00) and MDACC (p = 0.00, p = 0.00) populations (Table 4). In the JICR group, patients who underwent NAC or incomplete frontline therapy (chemotherapy only, surgery only, or neither chemotherapy nor surgery) were more common in the elderly group than in the younger patients. Suboptimal surgery was more common in the elderly patients than in the younger cases in both JICR (p = 0.00) and MDACC (p = 0.04) groups. The ascites volume of the elderly patients was greater than that of younger cases in both JICR (p = 0.03) and MDACC (p = 0.01) populations.

### Table 3. — Clinical management related factors in epithelial ovarian cancer.

| Characteristic                          | ≥ 70 years, n (%) | < 70 years, n (%) | p   |
|----------------------------------------|------------------|------------------|-----|
| ECOG PS*                              |                  |                  |     |
| 0                                      | 51 (37.5)        | 276 (52.2)       | 0.00|
| 1                                      | 56 (41.2)        | 215 (40.6)       |     |
| ≥ 2                                    | 29 (21.3)        | 38 (7.2)         |     |
| Comorbidity                            |                  |                  |     |
| 0-1                                    | 81 (59.6)        | 386 (73.0)       | 0.00|
| 2-3                                    | 32 (23.5)        | 106 (20.0)       |     |
| >3                                     | 23 (16.9)        | 37 (7.0)         |     |
| Type of primary therapy                |                  |                  |     |
| NAC*                                   | 31 (22.8)        | 75 (14.2)        | 0.00|
| PDS                                    | 60 (44.1)        | 384 (72.6)       |     |
| Chemotherapy only                      | 23 (16.9)        | 20 (3.8)         |     |
| No treatment                           | 16 (11.8)        | 39 (7.4)         |     |
| Unknown                                | 6 (4.4)          | 11 (2.1)         |     |
| Surgical interventions                 |                  |                  |     |
| BSO/ASO + hysterectomy                 | 71/87 (81.6)     | 364/434 (84.1)   | 0.72|
| Omentectomy                            | 69/87 (79.3)     | 350/434 (80.6)   | 0.89|
| Pelvic lymphadenectomy                  | 64/87 (73.6)     | 321/434 (74.0)   | 0.96|
| Para-aortic lymphadenectomy            | 36/87 (41.4)     | 179/434 (41.2)   | 0.92|
| Appendectomy                           | 34/87 (39.1)     | 169/434 (38.9)   | 0.92|
| EUAS                                   | 21/87 (24.1)     | 155/434 (35.7)   | 0.04|
| Surgical residual†                     |                  |                  |     |
| Optimal                                | 47 (51.6)        | 315 (68.6)       | 0.00|
| Suboptimal                             | 40 (44.0)        | 119 (26.0)       |     |
| Unknown                                | 4 (4.4)          | 25 (5.4)         |     |
| Postoperative complications            |                  |                  |     |
| None                                   | 66 (75.9)        | 352 (81.1)       | 0.33|
| At least one                           | 21 (24.1)        | 82 (18.9)        |     |

ECOG PS*, Eastern Cooperative Oncology Group Performance Status. NAC*, Neoadjuvant chemotherapy. Optimal cytoreduction†, the absence of macroscopic disease on the completion of the surgical procedure.
and baseline CA-125 level were associated with OS ($p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$, and $p < 0.01$, respectively) and PFS ($p < 0.01$, $p < 0.01$, $p < 0.01$, $p < 0.01$, and $p < 0.01$, respectively) in patients from JICR under univariate the Cox proportional hazards model (Table 5). OS and PFS were independently associated with FIGO Stage ($p < 0.01$ and $p < 0.01$), histological subtype ($p = 0.03$ and $p = 0.02$), and surgery outcome ($p < 0.01$ and $p < 0.01$) under the multivariate Cox proportional hazards model (Table 6).

In the MDACC population, FIGO stage ($p < 0.01$ and $p < 0.01$), histological subtype ($p = 0.03$ and $p = 0.02$), and surgery outcome ($p < 0.01$ and $p < 0.01$) were also independently associated with OS and PFS (Tables 7 and 8).

Elderly patients with type I EOC exhibited shorter OS

**Table 4. — Clinical management related factors in epithelial ovarian cancer from MDACC.**

| Characteristic                           | $\geq 70$ years, n (%) | $< 70$ years, n (%) | $p$  |
|-----------------------------------------|-------------------------|---------------------|------|
| Comorbidity                             |                         |                     |      |
| 0-1                                     | 114 (59.7)              | 562 (70.3)          | 0.00 |
| 2-3                                     | 45 (23.6)               | 183 (22.9)          |      |
| >3                                      | 32 (16.8)               | 54 (6.8)            |      |
| Type of primary therapy                 |                         |                     |      |
| NAC$^a$                                 | 20 (10.5)               | 42 (5.3)            | 0.00 |
| PDS                                     | 149 (78.0)              | 725 (90.7)          |      |
| Chemotherapy only                       | 10 (5.2)                | 16 (2.0)            |      |
| No treatment                            | 14 (7.3)                | 14 (1.8)            |      |
| Unknown                                 | 0                       | 2 (0.3)             |      |
| Surgical interventions                  |                         |                     |      |
| BSO/ASO + hysterectomy                  | 139/168 (87.7)          | 670/758 (88.4)      | 0.10 |
| Omentectomy                             | 141/168 (83.9)          | 674/758 (88.9)      | 0.09 |
| Pelvic lymphadenectomy                   | 126/168 (75.0)          | 576/758 (76.0)      | 0.86 |
| Para-aortic lymphadenectomy             | 71/168 (42.3)           | 326/758 (43.0)      | 0.93 |
| Appendectomy                            | 65/168 (38.9)           | 303/758 (40.0)      | 0.83 |
| EUAS                                    | 46/168 (27.4)           | 273/758 (36.0)      | 0.04 |
| Surgical residual$^b$                    |                         |                     |      |
| Optimal                                 | 103 (63.3%)             | 554 (72.2%)         | 0.04 |
| Suboptimal                              | 65 (36.3%)              | 204 (26.6%)         |      |
| Unknown                                 | 1 (0.4%)                | 9 (1.2%)            |      |
| Postoperative complications             |                         |                     |      |
| None                                    | 123 (73.2%)             | 607 (80.1%)         | 0.06 |
| At least one                            | 45 (26.8%)              | 151 (19.9%)         |      |

ECOG PS$^c$, Eastern Cooperative Oncology Group Performance Status. NAC$^a$, neoadjuvant chemotherapy. Optimal cytoreduction$^b$, the absence of macroscopic disease on the completion of the surgical procedure.

**Figure 1.** — Elderly patients have shorter overall survival and progression-free survival than younger cases with type I (A, B) and type II (C, D) epithelial ovarian carcinoma.

**Figure 2.** — Elderly patients still have shorter overall survival and progression-free survival than younger cases with type II (A, B) but not type I (C, D) epithelial ovarian carcinoma and underwent optimal surgery.
durations [136.5 months, 95% confidence interval (CI) 67.8–205.2 vs. 191.8 months, (CI) 155.0–228.6; Figure 1A] and PFS [35.5 months, (CI) 5.4–65.7 vs. 75.1 months, (CI) 43.0–107.3; Figure 1B] than those of the younger counterparts in the JICR population using the log-rank test. In type II cases, the elderly patients also exhibited poorer OS {38.4 months, (CI) 33.2–43.6 vs. 42.3 months, (CI) 36.8–47.7; Figure 1C} and PFS [14.9 months, (CI) 10.6–19.2 vs. 16.8 months, (CI) 14.0–19.6; Figure 1D] durations than those of younger cases.

The associations between survival duration and age were further analyzed by log-rank test in the patients from JICR who underwent optimal debulking. The OS and PFS durations of the elderly patients remained poorer than those of the younger patients with type II EOC (50.2 months, [CI] 43.5–56.9 vs. 68.0 months, [CI] 60.4–75.7, and 14.9 months, [CI] 10.4–19.5 vs. 19.2 months, [CI] 16.5–21.9, respectively; Figures 2A and B) but not in type I (149.7 months, [CI] 77.3–222.2 vs. 202.7 months, [CI] 183.5–222.0 and 69.4 months, [CI] 37.4–101.5 vs. 77.7 months, [CI] 6.9–148.1, respectively; Figures 2C and D).

Discussion

In the present study, the elderly patients (aged ≥ 70 years) constituted approximately 20% of the EOC patients in both JICR and MDACC populations. In terms of histological type, 90.4% of the elderly patients compared with 81.7% of the younger cases suffered from type II tumor in JICR, whereas 88.0% of the elderly group compared with 81.1%...
of the younger patients manifested type II disease in MDACC.

Consistent with previous reports, the present findings also showed that ovarian cancer in elderly women were more commonly discovered at an advanced stage, poorer ECOG performance status, and greater comorbidities and postoperative complications than that in younger women and were less incompatible with the recommended treatment [36–38]. Elderly patients with EOC were less likely to receive standard therapy than their younger counterparts in the present study. Presently, we showed that elderly patients were 32.5% less likely to receive aggressive EUAS than their younger patients [36, 37]. The present authors found that elderly women with EOC were 60.6% more likely to undergo NAC than younger women. The association between surgical interventions and age differed with cancer stage at diagnosis, ECOG performance status, and comorbidity; thus, treatment differences were related to age. The more advanced disease, more aggressive histological type, poorer performance status, or functional impairment may confer the risk of inferior survival in the elderly ovarian carcinoma [41]. However, some studies have reported that age remains an independent predictor of prognosis after considering the effect of these factors [42–44]. The present results showed that age could be independently associated with the prognosis of ovarian cancer. The OS and PFS durations of elderly patients with EOC were poorer than those of the younger counterparts. In the patients who received optimal debulking, the likelihood of survival of elderly patients was poorer than that of younger women with type II EOC.

Although the associations of age with tumor grade and type have been challenged by some studies [41, 45], the present authors found that type II EOC was more common in the elderly women than in the younger patients. Most ovarian cancer tumors are high-grade serous carcinomas; hence, ovarian cancer has long been regarded as a single disease. However, the different histological types of ovarian cancer display a distinct biology and clinicopathological characteristics. Shih et al. [46] proposed a dualistic classification that divides ovarian cancer into two broad categories, namely, types I and II. Supporting this model, the present results showed that type II EOC was more common in elderly women than in younger patients. The extremely poor prognosis of elderly EOC may be due to different tumor biological characteristics, discrepancies in clinical practice, and skewed distribution of clinicopathological characteristics [39, 47–51]. Advanced age was associated with prognosis after the influences of FIGO stage, histological type, and even the surgical outcome were excluded in the type II EOC patients who received optimal debulking, although the independence has been demonstrated by previous studies [15, 24].

The effects of age on survival outcome should be analyzed by identifying age-related clinicopathological characteristics in EOC patients. In the present study, well-characterized patients with EOC were retrospectively included in two high-volume gynecologic oncology centers to weaken the effect of the specialized treatment of different cancer centers that may contribute to the observed biased outcome. Another advantage was the considerable number of recruited patients with long-term follow-up information. The present study was also characterized by several limitations. Selection biases were unavoidable and inherent to retrospective nature of this study. The stringent inclusion criteria and stratified analyses might have partially minimized the influence of selected factors. A well-designed prospective trial that uses age as a variable should be conducted to confirm this issue. The absence of a specific standard for elderly patients with EOC may also cause bias. An MDT was assigned to guide clinical practice in the present study. Furthermore, studies on “elderly ovarian cancer” are limited by the lack of a clear definition. Therefore, the present results could not be extended to all elderly ovarian cancer cases.

Conclusion

Aggressive histological type, poor performance status, and undertreatment were commonly observed in elderly EOC patients than in younger patients. Advanced age was independently associated with poor prognosis in EOC even after the influence of histological type and surgical outcome was eliminated.

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