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ORIGINAL ARTICLE

Methods of Treatment and Outcome for Ovarian Germ Cell Tumors

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Abstract
Ovarian germ cell tumors account for about 15–20% of all ovarian tumors. They occur mainly in girls, adolescents, and young adults. This study aims to assess the different clinico-pathological factors of ovarian germ cell tumors, treatment methods, and outcome. This is a retrospective observational cohort study including 54 cases with OGCTs which were studied from the period between January 2013 and December 2016. The study was performed at National Cancer Institute (NCI)–Cairo University, Egypt. All cases had cytoreductive surgery in the form of unilateral salpingo-oophorectomy in 42 cases and total abdominal hysterectomy in 12 cases. Complete cytoreduction was achieved in 46 cases while 8 cases had residual disease after surgery. Adjuvant chemotherapy was given in 26 cases (stage II, III, and IV malignant OGCTs). The main treatment of ovarian germ cell tumors is complete cytoreductive surgery which can be achieved in many cases with unilateral salpingo-oophorectomy. Adjuvant chemotherapy is highly recommended in case of malignant ovarian germ cell tumors.

Keywords Germ cell ovarian tumors (GCOT) · Cytoreductive surgery (CRS) · Management

Introduction

Most cases of ovarian germ cell tumors (OGCTs) present at an early stage and at young age. Fertility-sparing treatment by unilateral salpingo-oophorectomy has equivalent outcome as total abdominal hysterectomy [1]. This study aims to assess different clinico-pathological features of OGCTs, the surgical treatment options (total abdominal hysterectomy–unilateral salpingo-oophorectomy), and the outcome of the treatment.

Patients and Methods

This is a retrospective observational cohort study performed at National Cancer Institute (NCI)–Cairo University including 54 cases with OGCTs treated and followed up between January 2013 and December 2016. This study included all patients who presented with OGCTs at NCI. Exclusion criteria were patients with incomplete data and those whose specimens proved pathologically to have epithelial ovarian cancer (EOC).

Surgical intervention was total abdominal hysterectomy in 12 patients while the remaining 42 patients had unilateral salpingo-oophorectomy. Complete cytoreduction was achieved in 46 patients while 8 patients had residual intra-abdominal disease after the surgery.

After the discharge of patients, they were followed up after 3 months, then regularly every 6 months with abdominal and pelvic CT scans and serum CA 125, AFP, B-hCG, LDH, CBC, renal, and liver function tests. The median follow-up period was 26 months. All patients were assessed according to their operative complications, overall survival, and disease-free survival. Overall survival was calculated as the length of time between diagnosis of the disease and the last point of time the patients were still alive. Disease-free survival was calculated as the length of time between the surgical treatment of the disease and time of first manifestation of recurrence or death.

The study was approved by the ethical committee of NCI. Clinical data were collected from hospital medical records and investigations' reports, recorded in a standard database form, and evaluated and analyzed by the authors. For this type of study (retrospective study), formal consent is not required.

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Data were analyzed using SPSS Win statistical package version 23. Numerical data were expressed as mean, standard deviation (SD), median, and range, as appropriate. Qualitative data were expressed as frequency and percentage. Survival analysis was done using Kaplan–Meier method.

Results

A total number of 54 patients with OGCTs were treated and followed up in this study. The median age was 27 years (range 17–73 years). Abdomino-pelvic swelling was the main manifestation in 35cases (35/54 of OGCT cases 64.8%). Twenty-two cases (22/54 of OGCT cases 40.7%) were mature teratomas, 15 cases (15/54 of OGCT cases 27.8%) were dysgerminomas, 10 cases (10/54 of OGCT cases 18.5%) were immature teratomas, 4 cases (4/54 of OGCT cases 7.4%) were yolk sac tumors, 1 case was choriocarcinoma (1/54 of OGCT cases 1.9%), and 2 cases (2/54 of OGCT cases 3.7%) were mixed GCTs.

Six cases (6/32 of malignant OGCT cases 18.75%) were stage I, 14 cases (14/32 of malignant OGCT cases 43.75%) were stage II, 9 cases (9/32 of malignant OGCT cases 28.1%) were stage III, and 3 cases (3/32 of malignant OGCT cases 9.4%) were stage IV. Clinico-pathological features are demonstrated in Table 1.

Surgical treatment was in the form of unilateral salpingo-oophorectomy in 42 cases (42/54 of OGCT cases 77.8%); the remaining 12 cases (12/54 of OGCT cases 22.2%) had total abdominal hysterectomy. Forty-six cases (46/54 of OGCT cases 85.2%) had complete cytoreduction with no residual disease while 8 cases (8/54 of OGCT cases 14.8%) were associated with residual lesion after surgery and these cases were malignant OGCTs (all mature teratoma cases had complete cytoreduction).

Table 1 Clinico-pathological features of ovarian germ cell tumors

Group		Number (%)
Age	< 30 years	43 (79.6%)
	≥ 30 years	11 (20.4%)
Pathology	Mature teratoma	22 (40.7%)
	Dysgerminoma	15 (27.8%)
	Immature teratoma	10 (18.5%)
	Yolk sac	4 (7.4%)
	Choriocarcinoma	1 (1.9%)
	Mixed GCTs	2 (3.7%)
Stage (malignant OGCTs, 32cases)	I	6 (18.75%)
	II	14 (43.75%)
	III	9 (28.1%)
	IV	3 (9.4%)

All cases of mature teratomas had complete cytoreduction, while 8 cases of malignant OGCTs had residual disease after surgery (8/32 of malignant OGCT cases 25%). Surgical treatment is demonstrated in Table 2.

Chemotherapy was given to 26 cases after surgery (26/32 of malignant OGCTs 81.25%) while the 6 cases with stage I malignant OGCTs who had complete cytoreduction (6/32 of malignant OGCT cases 18.75%) had no adjuvant chemotherapy.

Chemotherapy was associated with complete remission in 6 cases with residual disease after surgery (6/8 of cases with residual disease after surgery 75%), and disease regression in the remaining 2 cases (2/8 of cases with residual disease after surgery 25%).

Relapse occurred in 3 cases (3/32 of malignant OGCTs 6.5%) as retroperitoneal nodal recurrence; these were stage I and received no adjuvant chemotherapy (CTH) after surgery (3/6 of stage I malignant OGCT cases who had no adjuvant chemotherapy after complete cytoreductive surgery 50%). They were treated with chemotherapy: one of them (1/3 of relapse cases treated with CTH 33.3%) had complete remission with chemotherapy while the other 2 cases (2/3 of relapse cases treated with CTH 66.7%) had disease progression.

The median overall survival for patients with OGCTs was not reached in the whole group and the overall survival rate was 91.0%. The median disease-free survival was not reached in the whole group and the disease-free survival rate was 85.2%. There was no significant difference regarding overall survival or disease-free survival between the patients who had complete cytoreduction and those who had surgical residual.

Discussion

In this study, unilateral salpingo-oophorectomy was the main surgical procedure for most cases of OGCTs in our study (77.8% of all cases). The remaining 22.2% of cases had total abdominal hysterectomy. A total of 85.2% of all surgically treated cases had complete cytoreductive surgery with no residual disease. Only 8 cases (14.8% of surgically treated patients) were associated with residual lesions.

Different studies showed that unilateral salpingo-oophorectomy with preservation of the grossly free uterus and the contralateral ovary is an option for cases with the

Table 2 Surgical treatment and outcome

		Number (%)
Type of surgery	Unilateral salpingo-oophorectomy	42 (77.8%)
	Total abdominal hysterectomy	12 (22.2%)
Outcome of surgery	Complete cytoreduction	46 (85.2%)
	Incomplete cytoreduction	8 (14.8%)

clinically early-stage disease. Even after neo-adjuvant chemotherapy, more than 80% of these cases will have normal menstrual function, and those who become pregnant will have no increase in pregnancy complications [2, 3]. And the oncological outcomes are not affected by fertility-preserving surgery, even in the case of bulky metastatic disease elsewhere [4].

In a study of the Children's Oncology Group which included 25 girls with stage I malignant OGCTs who had surveillance after cytoreductive surgery, 12 patients had developed recurrence (12/25 of cases 48%). Among recurrent cases, 6 cases had loco-regional recurrence and 2 cases had distant metastases while 4 cases had elevated tumor markers only. Among the recurrent cases, 11 were successfully treated with chemotherapy. Four-year overall survival was 96% [5].

In this study, relapse occurred in 3 out of 6 cases with stage I malignant OGCTs who had no adjuvant chemotherapy after primary complete cytoreductive surgery. The 3 cases of relapse were in the form of retroperitoneal nodal recurrence. They were treated with chemotherapy as a definitive treatment of relapse, and one of them had complete remission with CTH, while the other 2 cases had disease progression but they have long-term post-operative survival (2 years after surgery).

Conclusion

OGCTs are rare neoplasms that mostly affect young patients in their second decade. The most common pathological malignant subtypes are dysgerminoma and immature teratoma. Fertility-preserving surgery is the main curative treatment in the early-diagnosed patients with OGCTS. Adjuvant treatment for patients in advanced stages will be beneficial for long-term survival, even if they have residual disease after surgery. Prognosis of malignant OGCTs is good with long overall survival and disease-free survival especially in patients responding to chemotherapy.

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Compliance with Ethical Standards NCI played no role in the study design, data collection, data analysis, or manuscript writing. All authors read and approved the final manuscript.

The study was approved by the ethical committee of NCI. Clinical data were collected from hospital medical records and investigations' reports, recorded in a standard database form, and evaluated and analyzed by the authors. For this type of study (retrospective study), formal consent is not required.

Conflict of Interest The authors declare that they have no conflict of interest.

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