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MATERIALS AND METHODS

The study was approved by the Ethics Committee at the Faculty of Medicine Siriraj Hospital, Mahidol University, approval number SI 009/2011. The medical records of ovarian cancer in pregnancy, presenting symptom, screening and diagnostic methods, staging, gestational age of diagnoses and pregnancy outcomes at Siriraj Hospital for the 13-year period (1998-2010) were reviewed and analyzed. SPSS version 13 was used to analyze the data. Pre-operative diagnosis with ultrasound was performed in all cases. Doppler studies were performed in some patients. All cases of pregnancy with ovarian cancer were recruited. The diagnosis was performed during pregnancy. All data was collected from the statistical and oncology units. One case was missing during pregnancy and excluded from the data.

RESULTS

During the 13-year period, 1998-2010, 8 cases of pregnant women with ovarian cancer were detected at Siriraj Hospital. All details of the pregnant patients are presented in Table 1. There were 6 cases of ovarian cancer stage I and 2 cases of ovarian cancer stage II. The mean maternal age was 31.8 (23-41) years old. The mean gestational age at diagnosis was 14.3 (9-22) weeks of gestation. The mean gestational age at diagnoses of pregnant patients with ovarian cancer stage I and II were 14.6 (9-22) and 13 (12-14) weeks of gestation, respectively. All of the patients presented with the symptom of abdominal masses. Two cases presented with abdominal
Ovarian cancer is a very rare malignancy in pregnant patients. Without ultrasound screening, ovarian cancer is usually detected during the post-partum period. At present, many asymptomatic adnexal masses are normally detected during first trimester ultrasound screening for fetal dating and abnormality.

### DISCUSSION

Ovarian cancer is very rare malignancy in pregnant patients. Without ultrasound screening, ovarian cancer is usually detected during the post-partum period. At present, many asymptomatic adnexal masses are normally detected during first trimester ultrasound screening for fetal dating and abnormality.

### TABLE 1. Details of pregnant patients with ovarian cancer during year 1998-2010.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pregnant patient number</th>
<th>Maternal age (years)</th>
<th>GPA</th>
<th>Type and staging</th>
<th>Gestational age of suspected diagnosis</th>
<th>Presenting symptom</th>
<th>Screening and diagnostic method</th>
<th>Gestational age of delivery</th>
<th>Gestational age of abortion</th>
<th>Management</th>
<th>Neonatal body weight (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>1</td>
<td>23</td>
<td>1,0,0</td>
<td>Epithelial I</td>
<td>14</td>
<td>Abdominal mass</td>
<td>**U/S</td>
<td>36</td>
<td>-</td>
<td>***SO+****CMT *****C/S</td>
<td>1,560</td>
</tr>
<tr>
<td>2006</td>
<td>2</td>
<td>37</td>
<td>1,0,0</td>
<td>Epithelial I</td>
<td>9</td>
<td>Abdominal mass and abdominal pain</td>
<td>**U/S</td>
<td>38</td>
<td>-</td>
<td><em><strong>SO</strong></em>***C/S</td>
<td>3,110</td>
</tr>
<tr>
<td>2005</td>
<td>3</td>
<td>32</td>
<td>2,1,0</td>
<td>Epithelial I</td>
<td>10</td>
<td>Abdominal mass</td>
<td>**U/S</td>
<td>38</td>
<td>-</td>
<td>***SO+****CMT Normal labour</td>
<td>2,960</td>
</tr>
<tr>
<td>2004</td>
<td>4</td>
<td>27</td>
<td>1,0,0</td>
<td>Epithelial II</td>
<td>14</td>
<td>Abdominal mass and abdominal pain</td>
<td>**U/S</td>
<td>-</td>
<td>18</td>
<td><em><strong>SO+</strong></em>* abortion</td>
<td>-</td>
</tr>
<tr>
<td>2004</td>
<td>5</td>
<td>41</td>
<td>4,2,1</td>
<td>Epithelial II</td>
<td>12</td>
<td>Abdominal mass and abdominal pain</td>
<td>**U/S</td>
<td>-</td>
<td>16</td>
<td><em><strong>SO</strong></em>***C/S</td>
<td>-</td>
</tr>
<tr>
<td>2002</td>
<td>6</td>
<td>31</td>
<td>1,0,0</td>
<td>Germ cell I</td>
<td>18</td>
<td>Abdominal mass</td>
<td>**U/S</td>
<td>36</td>
<td>-</td>
<td><em><strong>SO</strong></em>***C/S</td>
<td>2,820</td>
</tr>
<tr>
<td>2002</td>
<td>7</td>
<td>30</td>
<td>1,0,0</td>
<td>Epithelial I</td>
<td>15</td>
<td>Abdominal mass</td>
<td>**U/S</td>
<td>38</td>
<td>-</td>
<td><em><strong>SO</strong></em>***C/S</td>
<td>2,750</td>
</tr>
<tr>
<td>2001</td>
<td>8</td>
<td>33</td>
<td>1,0,0</td>
<td>Epithelial I</td>
<td>22</td>
<td>Abdominal mass</td>
<td>**U/S</td>
<td>39</td>
<td>-</td>
<td><em><strong>SO</strong></em>***C/S</td>
<td>2,850</td>
</tr>
</tbody>
</table>

*GPA = gravida, parity, abortion  **U/S = ultrasonography  ***SO = salpingo-oophorectomy  ****C/S = caesarean section  ***** t-abortion = therapeutic abortion  

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All patients with stage I of ovarian cancer (6 cases) subsequently had successful vaginal delivery. (Fig. 2) One case had neoadjuvant chemotherapy. (Table 1) The mean gestational age at delivery was 37.5 +/- 3.9 weeks. Of gestation. (Fig. 1) All patients had a stage I ovarian malignancy. Patient number 6 was diagnosed as germ cell malignancy. (Table 1) All patients with stage I ovarian cancer had normal or near-normal body weight. Patient number 1 had a recurrent ovarian malignancy. The rest were normal with a 5-year survival of 100%.
Pregnant patients with ovarian cancer always present with non-specific symptoms including abdominal or back pain, constipation, abdominal swelling and urinary symptoms which are normally detected in normal pregnancy. Some pregnant patients present with a lower abdominal mass or acute abdominal pain which is complicated by torsion of masses. From this study all pregnant patients with ovarian cancer presented with an abdominal mass while only 2 cases presented with abdominal pain. Physical and per-vaginal examinations followed by ultrasound are routinely performed according to the presenting symptoms. When the ultrasound is unclear, the diagnosis by magnetic resonance imaging (MRI) should be performed. Computed tomography (CT) should be avoided due to the risk of childhood malignancies and transient suppression of fetal thyroid from iodinated contrast agents. However, ultrasound only was performed to diagnose ovarian cancer in this study.

Adnexal masses which are found in pregnancy are mostly benign. Functional cysts, less than 5 cm, are always detected and disappear during the second trimester. Most persistent adnexal mass 5 cm or greater are mature teratoma.

Tumour markers of ovarian cancer including AFP, CA 125, hCG and CEA, cannot be used during pregnancy because oncofetal antigens are involved in biological function related to fetal development, differentiation and maturation. The levels are always elevated during pregnancy or in abnormal placentation and fetal abnormalities.

Epithelial ovarian cancers are the most common ovarian malignancy while germ cell tumour is the second most common one. Definite diagnosis must be followed by surgical intervention for pathological tissue diagnosis. From this study, 7 cases were epithelial ovarian cancer while only one case was germ cell malignancy. Therefore this series supported the evidence of the higher rate of epithelial ovarian cancer.

Surgical intervention should be performed in the indicated cases including persisting mass in the second trimester, mass larger than 10 cm in diameter and ultrasonographic findings suspected of malignancies (solid and mixed solid and cystic characteristics). Surgical intervention in those indicated cases is to diagnose malignancy and prevent the complications of adnexal mass including torsion, rupture or obstructed labour. Moreover, torsion or rupture of the mass may result in preterm delivery.

Surgical intervention with a midline incision can decrease the manipulation of the gravid uterus which can cause preterm labour, placental abruption and fetal loss. The most common tumours during pregnancy are benign dermoid cysts and mucinous and serous cystadenomas. Therefore cystectomy can be performed. If solid mass or other features of malignancy including ascites are detected, ipsilateral salpingo-oophorectomy should proceed. A frozen section should be organized in the same setting. If the frozen section confirms malignancy, full surgical staging and caesarean delivery should be performed. Surgical staging for stage I ovarian cancer is very important. The adjuvant chemotherapy must be considered following the histological type of tumours.

In obvious advanced staging, adequate surgical staging is less important because chemotherapy is needed after surgery to control metastasis. Caesarean hysterectomy is not necessary for maximal cytoreductive surgery at the initial surgery. A second operation for cytoreductive surgery can be performed after chemotherapy and successful completion of pregnancy. However, the prognosis of advanced stage ovarian cancer is poor, even though chemotherapy and complete delivery are performed.

From this study, salpingo-oophorectomy was performed in all cases of ovarian cancer stage I. Only 2 cases were combined with chemotherapy, and 4 cases had no subsequent chemotherapy. Two cases with advanced stage (stage II) ovarian cancer underwent therapeutic abortion.

Early termination of pregnancy does not improve the outcome of ovarian cancer. However, if the pregnancy is 34 weeks of gestation or greater, termination of pregnancy should be performed to avoid fetal exposure to maternal chemotherapy.

In conclusion, ovarian cancer in pregnancy is rare. Ultrasound screening can detect an abnormal adnexal mass during pregnancy. Thus, early diagnosis and management of ovarian cancer can prevent the complications of ovarian cancer in advanced stages.

ACKNOWLEDGMENTS

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REFERENCES


