We report a case of a 41-year-old man admitted with respiratory distress and found to have masses in both atria of the heart and in the testicle. The patient received palliative radiotherapy to relieving obstruction of blood flow tract caused by the intracardiac masses, followed by radical orchiectomy. After the diagnosis of testicular seminoma, he was treated successfully with 4 cycles of systemic chemotherapy. This is a rare case that presented with metastatic testicular seminoma involving both atria of heart and causing symptomatic obstruction of blood flow tract.

Key words: testicular cancer – seminoma – intra-atrial intracardiac mass

INTRODUCTION

The incidence of cardiac metastases of malignant neoplasia has increased to above 10%, while it was between 0.2 and 6.0% before 1996 (1). About 90% of the patients having cardiac metastases are clinically silent, although the development of tachycardia, arrhythmia, cardiomegaly or heart failure raises the suspicion of cardiac metastasis, especially in patients who have known underlying malignant diseases (2). Metastatic tumors can involve the heart by direct invasion, hematogenous spread and lymphatic spread. Sometimes tumors also spread to the heart from the inferior vena cava by intracavitary extension (3).

The cardiac metastasis of testicular germ cell tumor is extremely rare. Most of testicular germ cell tumors spread in a predictable progression to the para-aortic lymph nodes, mediastinal nodes and then supraclavicular nodes along the course of the thoracic duct (4). In particular, embryonal carcinoma and choriocarcinoma also have a greater propensity for hematogenous spread (5). Here we report a case of a 41-year-old man with both-sided intra-atrial intracardiac metastases from testicular seminoma, who was successfully treated with palliative radiotherapy to relieve the obstruction of outflow of both atria, followed by systemic chemotherapy.

CASE REPORT

A 41-year-old man with no prior medical history was admitted for 3-week history of progressive shortness of breath at rest, aggravating in a supine position. He was dyspneic, which was relieved by oxygen supply via nasal prong. Blood pressure was 130/80 mmHg, pulse rate 130 bpm, respiratory rate 25 bpm and body temperature 37.2°C. Heart sounds showed a diastolic cardiac murmur on tricuspid area. Lung sounds revealed fine crackle on both mid-lung fields and decreased breath sound on both lower lung fields. Further physical examination revealed a solid mass in the right testicle, measuring approximately 7 x 5 cm. Initial laboratory tests were as follows: an arterial blood gas analysis with pH 7.54, PaCO2 28 mmHg, PaO2 63 mmHg and total H2CO3 24 mmEq/l; a complete blood count with elevated white blood cell of 14 000/mm3, consisting of mainly neutrophils (87.2%), hemoglobin of 13.8 g/dl and platelet count of 467 000/mm3; and elevated liver enzymes with AST/ALT of 56/42 IU/l and total/direct bilirubin of 3.6/1.3 mg/dl. Tumor markers were negative for alpha fetoprotein (aFP: l2.6 IU/ml) and human chorionic gonadotropin (β-hCG: 1.0 mIU/ml), but the lactate dehydrogenase (LDH) level was elevated to 1277 IU/L. On initial chest radiograph, heart size was normal, but both hilar infiltration and blunt costophrenic angle was seen. Ultrasound of the testicle showed heterogeneous low echoic mass in right testis, as observed on physical examination. Echocardiogram showed huge intra-atrial masses in both sides.
with severe functional tricuspid stenosis and moderate pulmonary hypertension (Fig. 1).

Subsequent chest computed tomography (CT) scan revealed a 5.5 × 4.5 cm right intra-atrial mass, leading to severe obstruction of outflow of tricuspid valve, and a 7.0 × 5.0 cm left intra-atrial mass, extending to the pulmonary veins and obstructing outflow of them (Fig. 2). Interestingly, abdominal and pelvic CT scans did not show any evidence of metastasis in lymph nodes and intra-abdominal and intrapelvic organs, which was confirmed by subsequent whole body positron emission tomography (PET). The patient underwent emergency radiotherapy to intracardiac masses for 5 days with 1080 cGy before histologic diagnosis to relieve nearly complete obstruction of tricuspid valve and pulmonary veins although his symptoms improved 2 days after the commencement of palliative radiotherapy. He then underwent the right radical orchiectomy, of which surgical pathology was confirmed to be seminoma. Hypermetabolic lesions were seen in both atria as well as in the mediastinal lymph nodes in the whole body PET, which was performed

Figure 1. Transthoracic ultrasonic image of the heart before and after treatment. There are right atrial and left atrial masses at presentation (a and b), which disappear after completion of therapy (c and d).

Figure 2. Chest computed tomography before and after treatment. There is a right atrial mass at presentation (a). However, the mass disappears after completion of therapy (b).
before the administration of systemic chemotherapy (Fig. 3). After four cycles of chemotherapy consisting of etoposide, cisplatin and ifosfamide, follow-up CT chest and PET scans showed no intracardiac masses and hypermetabolic lesions (Figs 1–3). A follow-up EchoCG also showed neither anatomical nor functional abnormalities. The patient has now been followed up regularly at outpatient clinic with complete remission.

DISCUSSION

Cardiac metastases mostly occur in patients with disseminated malignant diseases. Although the incidence of cardiac metastases varies from study to study, it was reported up to 25% of post-mortem patients who had died of malignancies and has increased during recent decades due to better diagnostic tools and longer survival of cancer patients (5). However, cardiac metastases are usually clinically asymptomatic and are not noted until after death because most of them are small, reflecting only generalized tumor spread (5). Only about 10% are identified to have cardiac metastases at post-mortem examination presented with symptoms or findings indicative of cardiac metastases (1). Tumors, such as malignant melanoma and leukemia, have a high tendency of cardiac metastasis, while carcinoma of the lung and breast rarely metastasizes to the heart but occupies to the greatest number because of the high incidence of these tumors.

An autopsy series of 78 patients who died of testicular cancer showed that most common sites of metastases are lung, retroperitoneal nodes, liver, mediastinal lymph nodes and so on. Among them, three patients had pericardial metastases and three had intracardiac metastases (6). In another autopsy series, only two of 154 patients who died of testicular cancer had pericardial metastases and no intracardiac metastases were observed (7). However, to our best knowledge, although rare, over 20 cardiac metastases from germ cell tumors have been described in the literature (Table 1) (8–27). Of interest, the incidence of teratoma seemed to be high among germ cell tumors that caused cardiac metastasis, which might reflect whether they were chemotherapy-naïve or refractory/recurrent tumors after chemotherapy. Among the pathologic subtypes of germ cell tumors, the proportion of teratoma alone or mixed with other histology was reportedly less than 5% (28). However, over 50–60% of residual masses after chemotherapy can be

Figure 3. 18-FDG positron emission tomography before and after treatment. Hypermetabolic masses are present in intracardiac cavity (a) before treatment and disappear after treatment (b).
Table 1. List of documented cases of testicular germ cell tumor with intracardiac involvement

<table>
<thead>
<tr>
<th>Case no.</th>
<th>Reference</th>
<th>Age</th>
<th>Pathology of intracardiac tumor (testicular tumor)</th>
<th>Initial symptoms</th>
<th>Intracardiac location</th>
<th>Clinical situation and course</th>
<th>Management</th>
<th>Outcome (months)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Melvin et al. (8)</td>
<td>32</td>
<td>Embryonal carcinoma (Embryonal carcinoma)</td>
<td>Chest pain with SOB</td>
<td>RA</td>
<td>– Recurrent disease after radical orchiectomy only</td>
<td>Surgical resection</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>Maione et al. (9)</td>
<td>28</td>
<td>Embryonal carcinoma (Embryonal carcinoma)</td>
<td>Hemiparesis</td>
<td>RA</td>
<td>– No prior malignancies</td>
<td>Surgical resection</td>
<td>Died of unknown cause (12)</td>
</tr>
<tr>
<td>3</td>
<td>Pillai et al. (10)</td>
<td>42</td>
<td>Mature teratoma with choriocarcinoma (Teratoma)</td>
<td>SOB</td>
<td>IVC &amp; SVC-RA-RV</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Surgical resection followed by chemotherapy</td>
<td>Died of progressive disease (18)</td>
</tr>
<tr>
<td>4</td>
<td>O’Brien et al. (11)</td>
<td>22</td>
<td>Seminoma (Pure seminoma)</td>
<td>Chest pain and hemoptysis</td>
<td>IVC-RA</td>
<td>– No prior malignancies</td>
<td>Surgical resection followed by chemotherapy</td>
<td>CR (7)</td>
</tr>
<tr>
<td>5</td>
<td>Paule et al. (12)</td>
<td>42</td>
<td>Mature teratoma (Mixed teratoma with embryonal carcinoma)</td>
<td>DOE</td>
<td>RA-IVC</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Surgical resection followed by chemotherapy</td>
<td>CR (13)</td>
</tr>
<tr>
<td>6</td>
<td>Cheek et al. (13)</td>
<td>31</td>
<td>Embryonal carcinoma (Embryonal carcinoma)</td>
<td>Pleuritic chest pain</td>
<td>LA</td>
<td>– No prior malignances</td>
<td>Surgical resection followed by chemotherapy</td>
<td>CR (24)</td>
</tr>
<tr>
<td>7</td>
<td>Pickuth et al. (14)</td>
<td>23</td>
<td>NA (Teratoma undifferentiated)</td>
<td>Acute RV failure</td>
<td>RV-PA</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Chemotherapy</td>
<td>Died of pneumonia during chemotherapy</td>
</tr>
<tr>
<td>8</td>
<td>Pickuth et al. (14)</td>
<td>40</td>
<td>Differentiated teratoma (Malignant teratoma)</td>
<td>Cardiac murmur</td>
<td>RA</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Surgical resection</td>
<td>Died of progressive disease (24)</td>
</tr>
<tr>
<td>9</td>
<td>Moon et al. (15)</td>
<td>25</td>
<td>Mature teratoma (Mixed NSGCT)</td>
<td>Incidentally</td>
<td>RA-IVC, TV</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Incomplete surgical resection</td>
<td>No evidence of progression (24)</td>
</tr>
<tr>
<td>10</td>
<td>O’Donnell et al. (16)</td>
<td>20</td>
<td>Mature teratoma (Mixed teratoma with NSGCT)</td>
<td>Cardiac murmur</td>
<td>RV</td>
<td>– Recurrent disease after radical orchiectomy and chemotherapy</td>
<td>Surgical resection followed by chemotherapy</td>
<td>CR (36)</td>
</tr>
<tr>
<td>11</td>
<td>Parker et al. (17)</td>
<td>28</td>
<td>Mature teratoma (Mixed teratoma with NSGCT)</td>
<td>Lower extremity weakness and confusion</td>
<td>LA</td>
<td>– Recurrent disease after radical orchiectomy followed by chemotherapy and multiple surgery for recurrent diseases</td>
<td>Surgical resection</td>
<td>CR (12)</td>
</tr>
<tr>
<td>12</td>
<td>Stein et al. (18)</td>
<td>33</td>
<td>NA (Embryonal carcinoma)</td>
<td>Chest pain with DOE</td>
<td>LA</td>
<td>– Recurrent disease after radical orchiectomy only</td>
<td>Chemotherapy</td>
<td>Died of progressive disease (6)</td>
</tr>
<tr>
<td>13</td>
<td>Savarese et al. (19)</td>
<td>25</td>
<td>Mixed NSGCT (Mixed NSGCT)</td>
<td>Incidentally</td>
<td>IVC-RA-RV</td>
<td>– No prior malignancies</td>
<td>Surgical resection followed by chemotherapy</td>
<td>CR (24)</td>
</tr>
<tr>
<td>14</td>
<td>Low et al. (20)</td>
<td>14</td>
<td>NA (Embryonal carcinoma)</td>
<td>SOB</td>
<td>SVC-RA</td>
<td>– No prior malignancies</td>
<td>Chemotherapy</td>
<td>Died of progressive disease (6)</td>
</tr>
</tbody>
</table>

Continued
active undifferentiated malignancies or differentiated teratoma (29–31). In addition, differentiated teratoma is unstable because it grows or becomes malignant later (32–34).

In the present case, we started palliative radiotherapy without histologic diagnosis because of the imminency of cardiac outflow obstruction and then tried systemic chemotherapy after pathological diagnosis on radical orchectomy. In general, patients with stage III testicular seminoma are treated with standard chemotherapy regimens according to risk status, and only stage III seminoma with non-pulmonary visceral metastasis is categorized as intermediate risk. In addition, approximately 90% of advanced seminoma patients are cured with cisplatin-containing regimen. Therefore, when metastases not only to the heart but also to other critical organs are suspected, prompt diagnosis of germ cell tumor is important especially in young men with no medical history and painless testicular mass. They can be treated with effective systemic chemotherapy for symptomatic improvement as well as for cure of the disease without delay of or unnecessary treatment. However, the tumors refractory to or recurrent after chemotherapy should be considered to have teratoma components, which can be removed only by surgical resection.

**Conflict of interest statement**
None declared.

**References**


