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The utility of multi-detector computed tomography in the diagnosis of malignant pleural effusion in the patients with ovarian cancer

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ABSTRACT

Purpose: The purpose of this study was to retrospectively assess possible clinical predictors of malignant pleural effusion in patients with ovarian cancer.
Materials and methods: This review was performed on 38 ovarian cancer patients that showed pleural effusion in a CT scan and who underwent thoracocentesis before treatment. CT scans were obtained using a 4-channel multi-detector CT scanner. Fisher's exact test was used to determine the probability of malignant pleural effusion as a function of; amount of ascites, lymph node enlargement, amount of pleural effusion, pleural nodules, and pleural thickening.
Results: Sixteen (42.1%) of the 38 patients had malignant pleural effusion and malignant pleural effusion amounts were greater than those with nonmalignant effusion.

Pleural nodules were more frequently found in the malignant pleural effusion group (eight [50%] patients) than in the nonmalignant group (zero [0%] patient) ($p < 0.001$). Supradiaphragmatic lymph node enlargement (with short axis diameter 1 cm or more) was more frequent in malignant group (12 [75%] patients) than in the nonmalignant group (two [9.1%] patients) ($p < 0.001$).
Conclusion: The probability of malignant pleural effusion in patients with ovarian cancer was found to be correlated with the amount of pleural effusion, the presence of pleural nodules, and supradiaphragmatic lymph node enlargement.

Ovarian cancer is the leading cause of death from gynecological malignancies in the United States, accounting for >15,000 estimated death in 2006 [1]. Although 5-year survival rate of patients with stage I disease is higher than 90%, survival rates of stage III (advanced regional disease) or IV (distant disease) are approximately 30–50% and 13%, respectively and the prevalence of stage III or IV disease at diagnosis is approximately 75% [2,3]. Malignant pleural effusion in ovarian cancer patients is noted for its poor prognosis as a stage IV disease. Besides, malignant pleural effusion in recurrent ovarian cancer also is associated with poor prognosis [4]. Therefore, it is critical to determine whether a pleural effusion is benign or malignant in ovarian cancer patients, especially when there is no evidence of distant metastasis.

Computed tomography (CT) scans have been used extensively as a diagnostic and surveillance tool in patients with ovarian cancer. However, CT has hardly contributed to the determination of whether an effusion is benign or malignant [5], because the findings suggestive of malignant pleural effusion such as pleural nodules or thickening have low sensitivity [6–8]. However, extrapleural CT findings such as mediastinal lymph nodes and hepatic nodules were findings associated with an increased probability of the pleural effusion being malignant [6–9]. Besides, the routine CT scan in staging or follow-up of ovarian cancer is abdominal-pelvis CT covering from the lower thorax to pelvic cavity [10], and most of the chest metastatic disease were found at the level of the lung bases and could be detected on the uppermost images during abdominal CT scan [11]. Therefore, we postulated that extrapleural findings other than pleural nodules on abdominal-pelvis CT scan could help to differentiate malignant effusion from nonmalignant effusion in ovarian cancer patients. To our knowledge, there have been no reports about the CT features, which are related with malignant pleural effusion in the ovarian cancer patients in the English literature. We undertook this study to retrospectively assess possible CT

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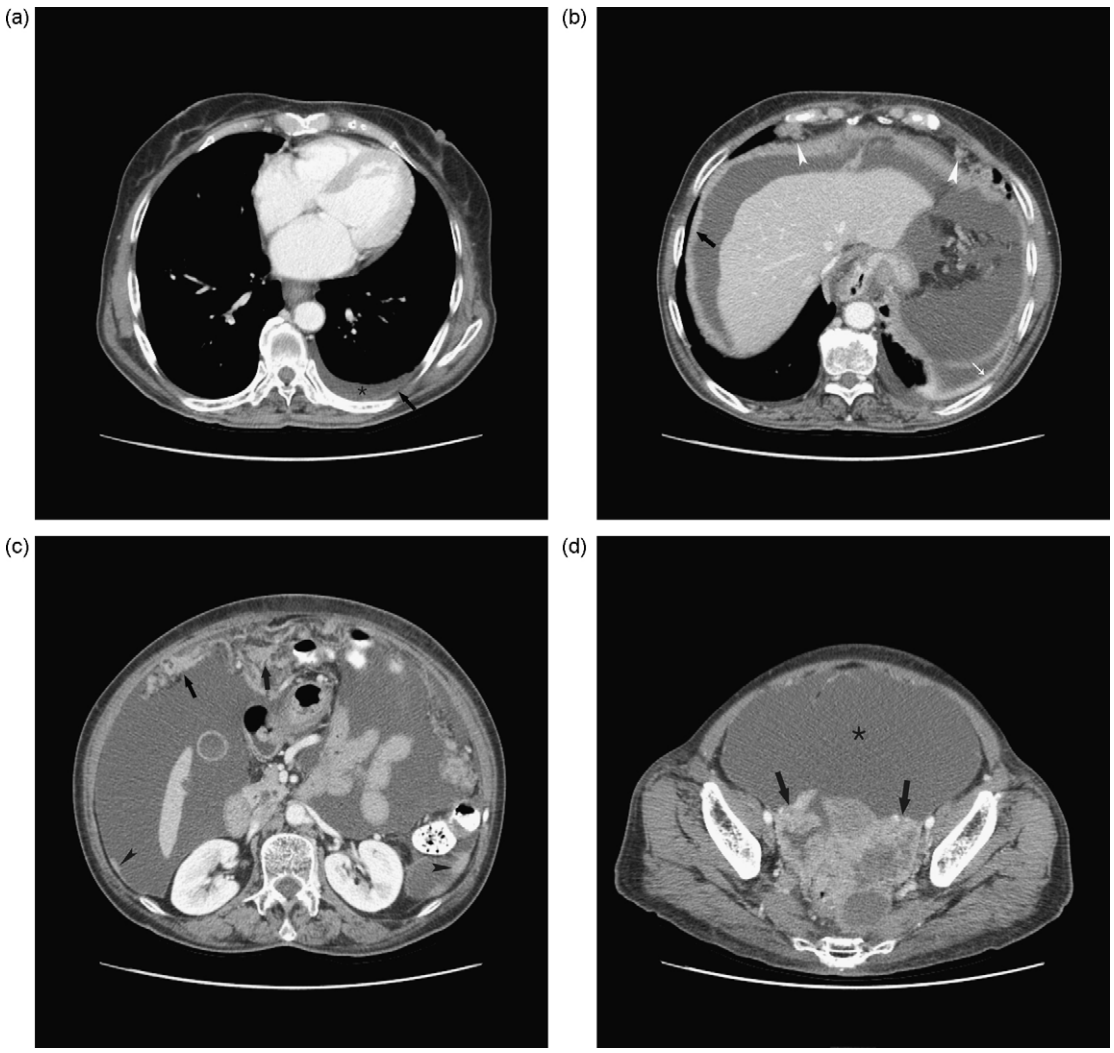

Fig. 1. Malignant pleural effusion in 72-year-old woman with bilateral ovarian serous cystadenocarcinomas. (a) Contrast-enhanced CT scan shows small amount of pleural effusion in left pleura (asterisk). Note thickening of left parietal pleura (arrow). (b) Contrast-enhanced CT scan shows peritoneal implant in subdiaphragmatic area (large arrow) and parietal pleural thickening (small arrow). Note enlarged supradiaphragmatic lymph nodes (arrowheads). (c) Contrast-enhanced CT scan shows nodular thickening of peritoneum (arrowheads) and omental cake (arrows). (d) Contrast-enhanced CT scan shows solid and cystic ovarian masses in both adnexa (arrows). Note large amount of ascites (asterisk).

predictors of malignant pleural effusion in patients with ovarian cancer.

1. Materials and methods

1.1. Patient population

We obtained approval from the institutional review board of our institution for this study; however, written informed consent was not required because the image data were retrospectively obtained from the routine abdominal-pelvis CT scans. A retrospective search of the medical records of our institution identified 268 patients who underwent operations for ovarian malignant tumors between January 2000 and January 2006. Among these patients, there were 54 (20.1%, 54/268) patients with pleural effusion detected on preoperative CT. Of these, 38 (14.2%, 38/268) patients who showed no evidence of stage IV disease other than malignant pleural effusion and underwent thoracocentesis before any kind of treatment were included in our study. We excluded the patients who did not undergo thoracocentesis ($n = 16$).

1.2. Histopathologic evaluation

Histopathologic evaluation of pleural effusion was the diagnostic standard. Pleural effusion was examined microscopically by a experienced pathologist (J.W.Y.). We performed additional thoracocenteses in 10 patients with negative cytology in initial exam (Figs. 1–3).

1.3. Image acquisition

All CT data were obtained using a 4-channel multi-detector CT scanner (Mx 8000; Marconi Medical System, Israel). Preoperative CT scans were obtained in a single institution an average of 43.5 days before surgery (range, 1–154 days) and 12.3 days before thoracocentesis (range, 0–41 days). All the patients received IV contrast material (Iopromide, Ultravist 300, Schering, Berlin, Germany) in an antecubital vein via mechanical injector, 140 mL was administered at a rate of 2.3 mL/s. Scanning began 70 or 80 s after the start of IV contrast material injection and covered the region from the lower thorax to the lower pelvis. Scanning parameters included a detector array of 1.25 mm × 4 mm, beam pitch of 1.35,