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## Case Report

# Diffuse malignant peritoneal mesothelioma mimicking ovarian cancer. ☆

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## ABSTRACT

Diffuse malignant peritoneal mesothelioma (DMPM) and peritoneal carcinomatosis have similar computed tomography imaging features. Peritoneal carcinomatosis is a known metastatic site for many malignancies and particularly gastrointestinal tract and ovarian cancers. Also, DMPM can masquerade as an ovarian epithelial neoplasm, with very similar clinical presentation and an overlap in imaging findings. When no evident primary tumor is detected other than the peritoneal disease, primary malignant mesothelioma should be considered. Since accurate diagnosis is essential for treatment management, the gold standard in differentiating between these two entities lies in histological analysis. We report a case of DMPM that was initially misdiagnosed as an ovarian cancer, where the biopsy of a peritoneal nodule was able to correct and confirm the diagnosis of DMPM.

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## Introduction

Diffuse malignant peritoneal mesothelioma (DMPM) is a rare and very aggressive primary tumor of the peritoneum with a

clinical and imaging presentation similar to peritoneal carcinomatosis (PC). Furthermore this pathology can mimic an ovarian cancer. History of asbestosis exposure is one of the main risk factors that one should look for. Imaging plays a key role for suggesting the correct diagnosis and narrowing the

DMPM, Diffuse malignant peritoneal mesothelioma; PC, Peritoneal carcinomatosis; CT, Computed tomography; IHC, immunohistochemistry.

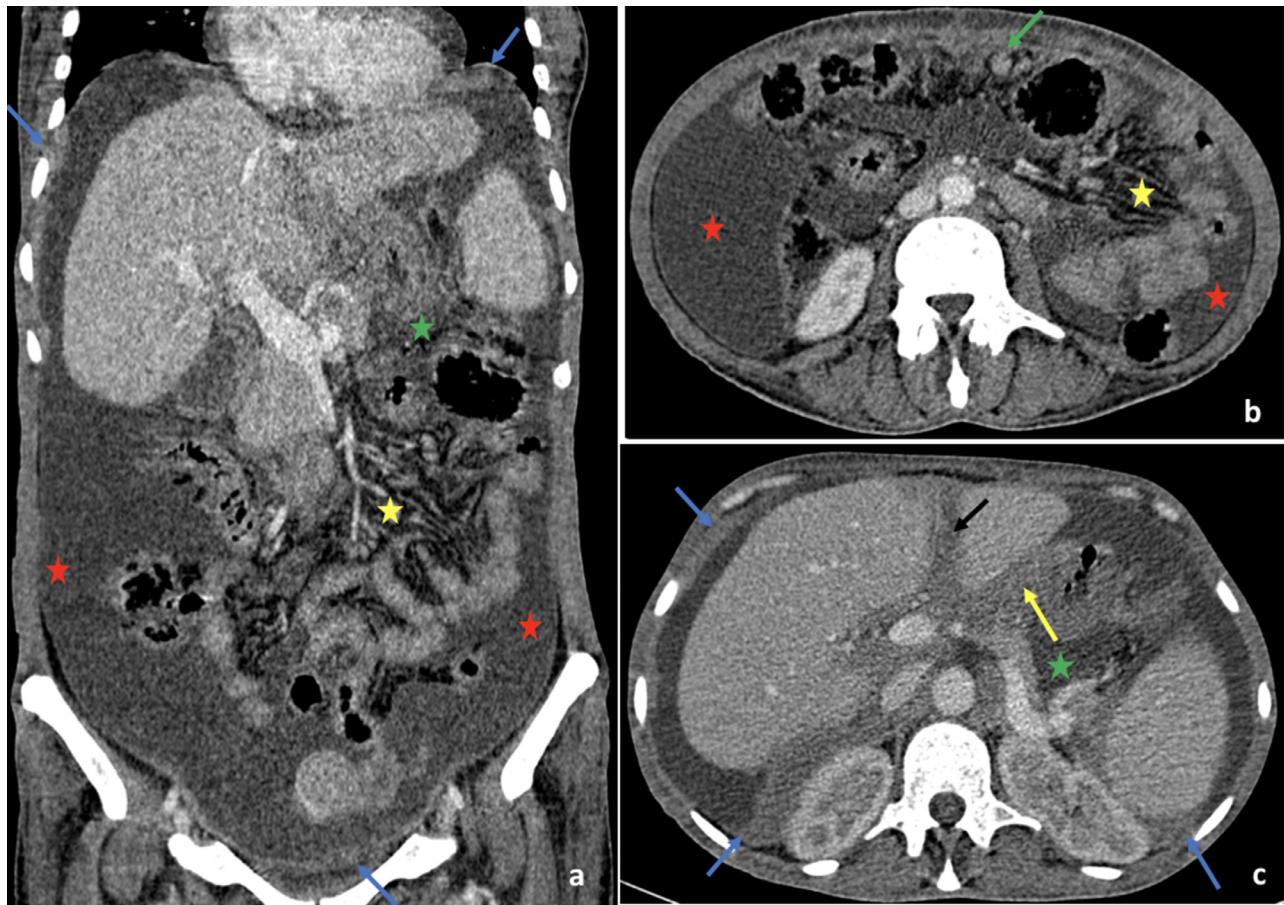
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**Fig. 1** – Computed tomography (CT) images in coronal (A) and axial (B, C) planes: Peritoneal effusion of great abundance located in the perihepatic, peri-splenic space, omental bursa (green star), the paracolic gutters bilaterally (red stars), and the pelvis. Diffuse irregular thickening of the enhanced peritoneal layers after injection, marked in the subphrenic regions. Infiltration of the lesser omentum (yellow arrow) and falciform ligament (black arrow). Fat stranding and nodularity of the greater omentum (green arrow). Thickening of the mesentery (yellow star) with agglutination of bowel loops.

differential possibilities. Ultrasound-guided biopsy with histological study confirms the diagnosis.

### Case report

We report the case of a 42-year-old woman, with no past medical history, complaining of pelvic pain and progressive abdominal distension for the last 3 months. Physical examination found a distended abdomen with no associated abnormal findings. An abdominal ultrasound revealed high volume anechoic peritoneal effusion. Further investigation with abdominopelvic computed tomography showed extensive peritoneal disease with large volume ascites, peritoneal nodularity, irregular omental thickening and bilateral ovarian tissue masses (Figs. 1 and 2).

The diagnosis of ovarian carcinoma with peritoneal involvement was initially suggested. An ultrasound-guided nee-

dle biopsy of a peritoneal nodule was then performed to make the accurate diagnosis (Fig. 3).

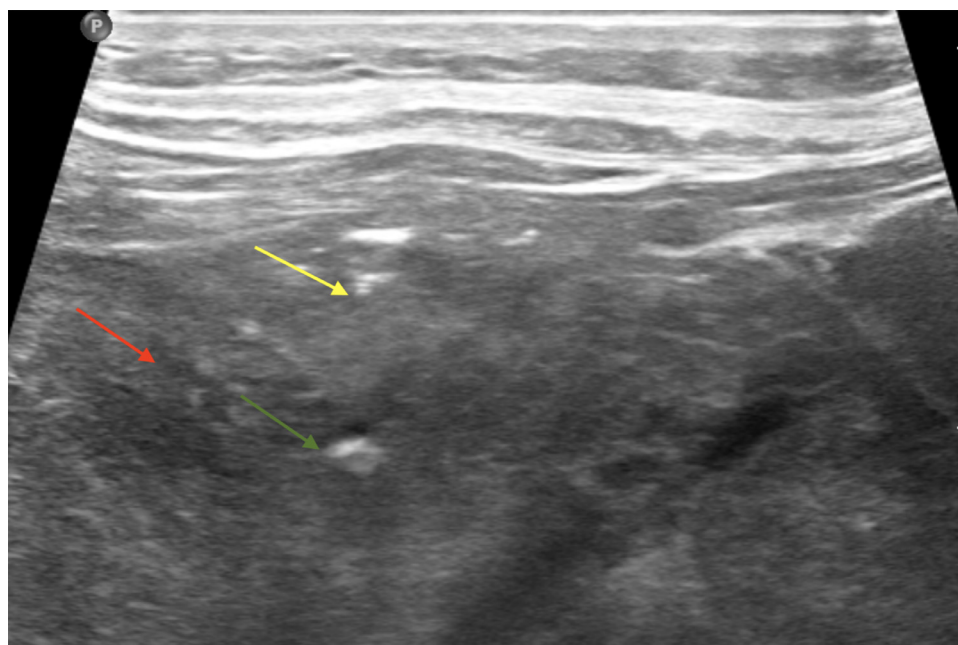
In fact, the definitive diagnosis was based upon histopathological analysis, mainly via immunohistochemistry (Figs. 4 and 5).

Microscopically, the tumor was composed of diverse histologic patterns as tubulo-papillary structures, adenomatoid-like, and solid nests of neoplastic epitheloid cells with slightly hyperchromatic nuclei showing prominent nucleoli.

An immunohistochemical supplement was necessary to increase diagnostic accuracy and determine the primitive or metastatic nature of the tumor. It exhibited positive staining for mesothelial markers as Wilms' tumor 1 antigen and calretinin, as well as carcinoma markers such as epithelial membrane antigen, cytokeratin 7, cytokeratin 5/6, and pancytokeratin AE1/AE3. Hormone receptors and inhibin were negative. Thus, the diagnosis of malignant peritoneal mesothelioma, epitheloid type, with ovarian metastasis was made. Retrospectively, the patient revealed an occupational exposure to asbestosis.



**Fig. 2 – Axial and sagittal computed tomography (CT) views: Two suspicious ovarian masses, with irregular contours, heterogeneously enhanced after contrast media injection (blue stars). Thickening of the peritoneal folds at the level of the bladder dome (green arrow) and Douglas pouch (red arrow).**



**Fig. 3 – Transverse ultrasound section with a superficial probe during ultrasound-guided biopsy showing a poorly limited, hypoechoic and heterogeneous mass of the greater omentum (red arrow). Note the path of the needle (yellow arrow) and its tip (green arrow) within the mass.**

## Discussion

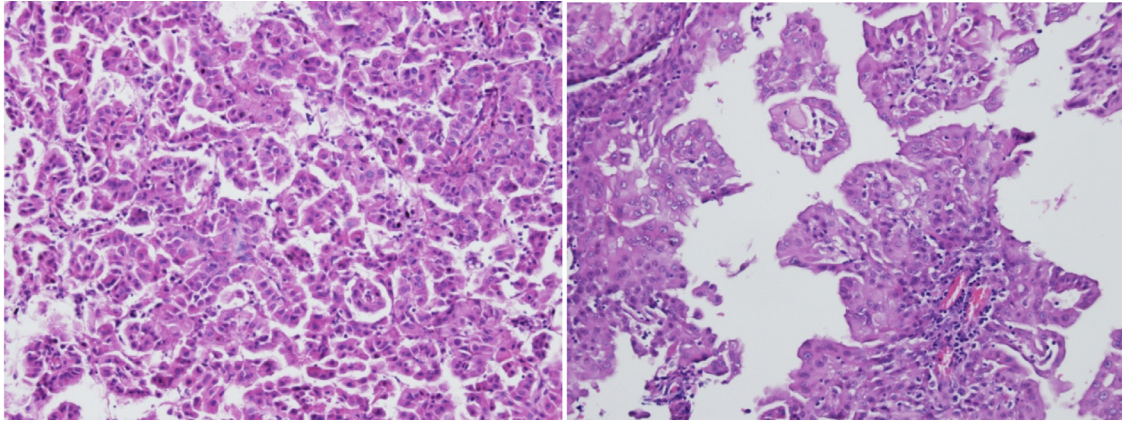
Mesothelioma is a rare primary connective tumor of either the pleural, peritoneal or pericardial serosal membranes. Associated with exposure to asbestos fibers, typically with a long latency, peritoneal involvement is observed in 25% of cases. DMPM is a rare but aggressive tumor arising from the serosal lining of the peritoneal cavity.

There are different types of peritoneal mesothelioma, falling into four groups: malignant mesothelioma, cystic mesothelioma, adenomatoid tumor and well differentiated papillary mesothelioma. Only a minority of the cases have history of significant asbestos exposure [1].

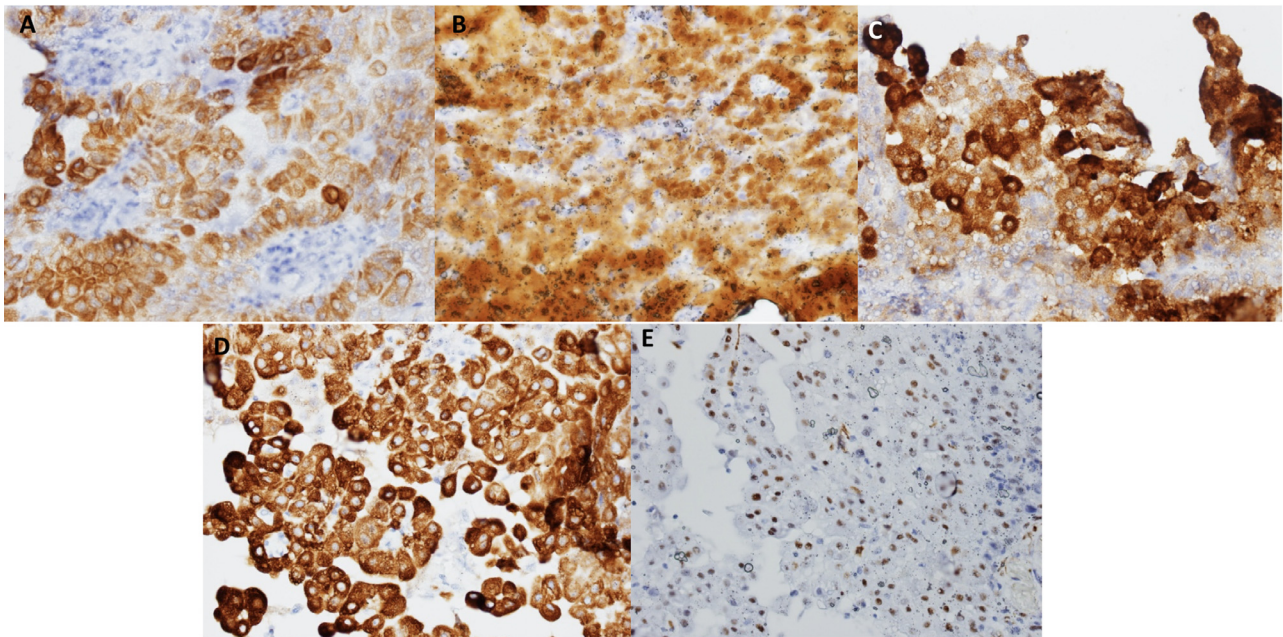
Clinical presentation is nonspecific, symptoms may include abdominal pain and/or distension, weight loss, nausea, fever and fatigue.

Also, macroscopic features are similar to those seen in peritoneal carcinomatosis, including ascites, diffuse and/or nodular thickening of the peritoneal serosa, infiltration of the greater omentum with sometimes the formation of omental “cakes” and mesenteric masses [1].

Peritoneal malignant mesothelioma produces two distinct patterns on cross-sectional images that reflect its gross pathologic appearance: diffuse involvement of the peritoneal cavity and focal intraperitoneal masses. The diffuse pattern is characterized by tumor infiltrating and thickening the peritoneum in a sheetlike fashion. Consequently, there is irregular



**Fig. 4 – Microscopic examination showing epithelioid tumor cells with papillary and adenomatoid-like structure and exhibiting slightly hyperchromatic nuclei with prominent nucleoli. (hematoxylin and eosin stain, original magnification x200).**



**Fig. 5 – The tumor cells show positive staining to calretinin (A), EMA (B), cytokeratin 7 (C), cytokeratin 5/6 (D), and WT1 (E) antibodies (IHC stain, original magnification x400). EMA, epithelial membrane antigen; WT1, Wilms' tumor 1.**

and nodular thickening of the peritoneum. The focal pattern is characterized by dominant, moderate to large-sized intraperitoneal masses with associated peritoneal studding [2].

If diagnostic proof can generally only be provided by pathological examination, there are, however, a number of clinical and computed tomography imaging findings in favor of a mesothelioma.

Early in the disease progression, nodular peritoneal and omental masses may be identified. As the disease evolves, the nodules become more confluent plaque-like masses and even-

tually omental “caking” is observed. However these signs can also be seen in PC [3].

Smooth, confluent and irregular thickening of the peritoneum, especially severe peritoneal thickening >1 cm. The thickening pattern and contrast enhancement of the peritoneum are useful signs for distinguishing between DMPM and PC [1].

The amount of ascites associated with diffuse malignant mesothelioma is quite variable, ranging from massive, diffuse ascites to focal, small, loculated collections of fluid [3,4].

Malignant mesothelioma may infiltrate the small bowel mesentery, thickening the leaves of the mesentery and producing a pleated or stellate appearance on cross-sectional images. Tumor infiltration of the small bowel mesentery fixates the small bowel and its mesentery, straightening the course of the mesenteric vessels. It has a tendency to spread along serosal surfaces and for direct invasion of both solid and hollow intra-abdominal organs [2,4]. Involvement of viscera including ovarian, colon and liver metastasis are usually secondary to bulky and extensive serosal disease and direct invasion. In fact, the major growth pattern of MPM is local infiltration, and metastases are exceedingly rare in spite of its extensive intra-abdominal involvement [5].

The presence of lymph node enlargement in a patient with diffuse peritoneal disease suggests another etiology, such as diffuse peritoneal carcinomatosis, lymphomatosis, or tuberculous peritonitis. When no evident primary tumor is detected other than the peritoneal disease, primary malignant mesothelioma should be considered [5].

The presence of calcified pleural plaques suggesting exposure to asbestos. These plaques are often located in both sides of the middle and lower chest walls with a symmetric distribution, which indicates a substantial exposure to asbestos [4].

As in peritoneal carcinomatosis related to ovarian cancer or mucin producing gastro intestinal tumors, there may also be calcifications of the tumor masses.

DMPM remains a diagnostic challenge owing to the overlap of clinical presentation and imaging features making it difficult to distinguish this disease from its mimics.

Therefore, histopathologic confirmation is required with mainly image guided core needle biopsy.

Nevertheless, MPM can be difficult to assess entirely on histologic features, making immunohistochemical markers pivotal for diagnosis.

In that matter, calretinin and CK 5/6 are strongly positive in nearly 100% of MPM, with significantly weaker positive staining to these markers in ovarian serous carcinoma. When combined with panels for epithelial and adenocarcinoma (CK7, CK20, ER, D240, BerEP4) and ovarian markers such as PAX-8, the distinction can be made easily. Examination of papillary architecture, nuclear atypia, and mitotic rates can further aid in distinguishing these two entities. In serous ovarian cancers, the papillae have more hierarchical branching, cellular stratification, and detached cell clusters, whereas in MPM, the papillae are broader with hyalinized cores and no budding. Serous ovarian cancers also have more nuclear atypia with frequent anaplastic or bizarre nuclei and abnormal mitotic figures, as well as higher mitotic rates [6,7].

No single immunohistochemical marker is specific for MPM. Instead, panels of markers are used to differentiate MPM from other more common tumors that can have similar histologic features such as serous ovarian carcinomas. The current recommendation is to use two mesothelioma markers and two carcinoma markers [8,9].

Therefore, histologic features and immunohistochemical staining characteristics will together usually allow to differentiate MPM from serous and other adenocarcinomas.

## Conclusion

DMPM and peritoneal carcinomatosis are very similar on imaging. However, it is important to be able to consider the diagnosis of DMPM when no evident primary tumor is found in patients with a known exposure to asbestos.

The diagnosis of malignant peritoneal mesothelioma can be made prospectively and noninvasively with the use of sonography, computed tomography and fine-needle biopsy.

Accordingly, the gold standard in differentiating between these two entities remains in tissue examination for pathological confirmation.

## Patient consent

Written informed consent for publication was obtained from the patient.

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