

Case Report

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Peritoneal Mesothelioma: A Case Report and Review

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Abstract

Despite its low incidence, peritoneal mesothelioma manifests with nonspecific symptoms, often leading to delayed diagnosis. Diagnosis relies on imaging techniques, histopathological evaluation, and immunohistochemistry, with emerging molecular markers refining diagnostic accuracy. The cornerstone of treatment is cytoreductive surgery combined with hyperthermic intraperitoneal chemotherapy, tailored to individual tumor characteristics and patient factors. Future directions involve targeted therapies and immunomodulatory agents, emphasizing multidisciplinary collaboration and translational research. This review aims to enhance understanding and optimize management, ultimately improving outcomes for affected individuals.

Keywords: Peritoneal; Mesothelioma; Omental; HIPEC.

Introduction

Peritoneal mesothelioma, a rare and aggressive cancer originating from the mesothelial lining of the peritoneum, represents a challenging clinical entity. Despite its infrequency, accounting for only 15% of all mesothelioma cases, it poses significant diagnostic and therapeutic dilemmas [1]. Here, we provide a comprehensive overview of the current understanding of peritoneal mesothelioma, encompassing epidemiology, diagnostic modalities, histopathological classification, molecular markers, and contemporary therapeutic strategies.

Case presentation

We present a 45-year-old male with a history for peptic ulcer disease and alcohol use disorder, now abstinent for one year. He presented to the emergency department with progressively worsening abdominal pain and constipation, accompanied by symptoms of anorexia and weight loss. On physical examination, abdominal distention and diffuse tenderness to palpation were noted. CT abdomen with contrast (Figures 1 and 2) revealed a large, complex fluid collection or irregular soft tissue surrounding

the spleen, along with thickening of the right hemidiaphragm and adjacent liver. Additionally, there was mild ascites with associated stranding and edema of the anterior mesentery. A peri splenic mass biopsy demonstrated an epithelioid neoplasm with mild to moderate atypia. Immunohistochemistry was positive for CK7, D2-40, and calretinin, while negative for TTF-1, arginase, glypican-3, AFP, CDX2, CK20, HepPar 1, consistent with an epithelioid mesothelioma. A PET/CT scan (Figures 3 and 4) revealed FDG-avid masses involving the peri splenic, perihepatic, and pelvic peritoneum, the left lower pelvis and around the falciform ligament, with suspicion for liver involvement as well as omental caking in the upper and mid-abdominal regions. Additionally, mildly FDG-avid lymphadenopathy was observed, raising concern for metastatic disease. Upon multidisciplinary discussion, the consensus was to proceed with cervical/axillary lymph node biopsy to confirm metastatic disease. Depending on the biopsy results, surgical debulking with Hyperthermic Intraperitoneal Chemotherapy (HIPEC) would be considered if the disease was non-metastatic, whereas palliative chemotherapy with cisplatin and pemetrexed would be proposed if lymph node metastasis was confirmed.

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Methods

Literature review: A comprehensive literature search was conducted using electronic databases including PubMed, Embase, and Google Scholar. The search strategy employed a combination of Medical Subject Headings (MeSH) terms and keywords related to peritoneal mesothelioma, epidemiology, diagnostic modalities, histopathological classification, molecular markers, and therapeutic strategies. Articles published in English from inception to the present were considered for inclusion. The search was augmented by manual screening of reference lists from relevant articles to ensure comprehensive coverage of the topic.

Epidemiology and clinical presentation

Peritoneal mesothelioma demonstrates an annual incidence of approximately 1.2 per million person-years in men and 0.8 per million person-years in women [2]. Although accounting for a minority of mesothelioma cases, its clinical manifestations are often nonspecific, including abdominal pain, palpable mass, and ascites, leading to delayed diagnosis [3]. Notably, peritoneal mesothelioma shares histopathological features with its more common pleural counterpart, influencing diagnostic and therapeutic approaches.

Diagnostic modalities

The diagnosis of peritoneal mesothelioma relies on a combination of imaging techniques and histopathological evaluation. Serum markers, such as CA-125 and Soluble Mesothelin-Related Peptide (SMRP) can be supportive. Contrast-enhanced CT of the chest, abdomen, and pelvis, as well as FDG-PET/CT scan, play pivotal roles in delineating disease extent and guiding biopsy. Laparoscopic or image-guided biopsy remains the gold standard for histological confirmation, with immunohistochemistry providing valuable insights into tumor subtyping [4].

Histopathological and molecular characterization

Peritoneal mesothelioma encompasses three histological subtypes: epithelioid, sarcomatoid, and biphasic, each bearing distinct prognostic implications. Immunohistochemistry, utilizing markers such as calretinin and D2-40, aids in subtype classification [5]. Furthermore, emerging evidence highlights the relevance of cytogenetic, including CDKN2A deletion and BAP1 mutation, and molecular markers EWSR1:ATF1 fusion and ALK rearrangements in refining diagnostic accuracy and prognostication [6,7]. Notably, germline mutations such as BAP1, BRCA2, CDKN2A, TMEM127, VHL, WT1, MRE11A, and MSH6 are identified in 12-16% of mesotheliomas, particularly in young individuals with a family history of mesothelioma or synchronous malignancies [8].

Therapeutic strategies

The cornerstone of treatment for peritoneal mesothelioma is Cytoreductive Surgery (CRS) combined with Hyperthermic Intraperitoneal Chemotherapy (HIPEC) [9]. CRS aims to debulk tumors maximally, followed by intraperitoneal administration of heated chemotherapeutic agents, including cisplatin, doxorubicin, carboplatin, and mitomycin C. Patient selection for CRS+HIPEC depends on histological subtype, disease burden, and performance status, with meticulous attention to perioperative management and surveillance.

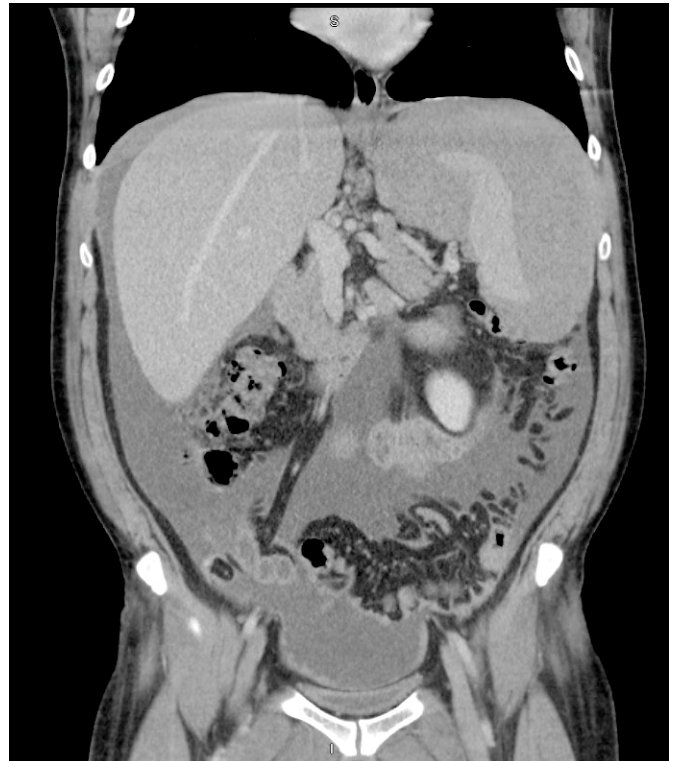


Figure 1: Coronal view: CT abdomen with perisplenic mass and right hemi diaphragmatic thickening along with omental caking.

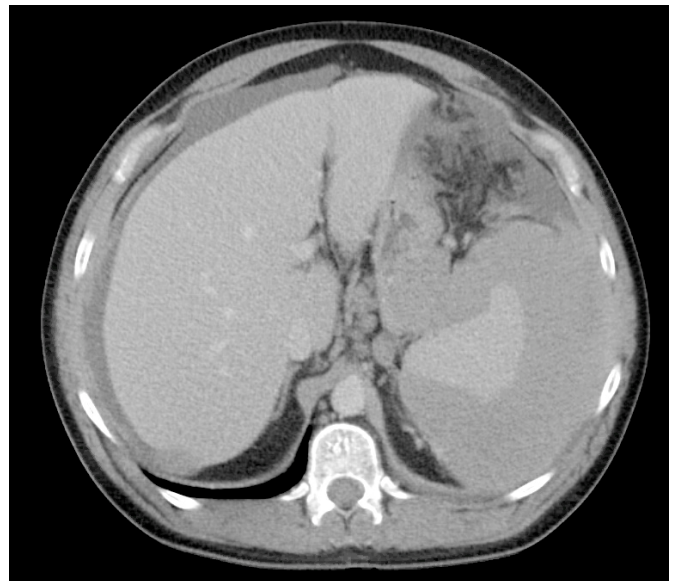


Figure 2: Transverse view: CT abdomen with perisplenic mass and right hemi diaphragmatic thickening.

This treatment strategy is tailored to individual tumor characteristics and patient factors. It is primarily indicated for epithelioid tumors with favorable prognostic factors (e.g., medically operable with Complete Cytoreduction (CC) score i.e. CC-0 or CC-1 [10], absence of lymph node involvement, Ki-67 \leq 9%, Peritoneal Cancer Index [PCI] \leq 17) [11]. Biphasic/sarcomatoid tumors may undergo CRS+HIPEC after tumor regression with systemic chemotherapy or in cases of recurrent disease after previous CRS beyond 12 months [12].

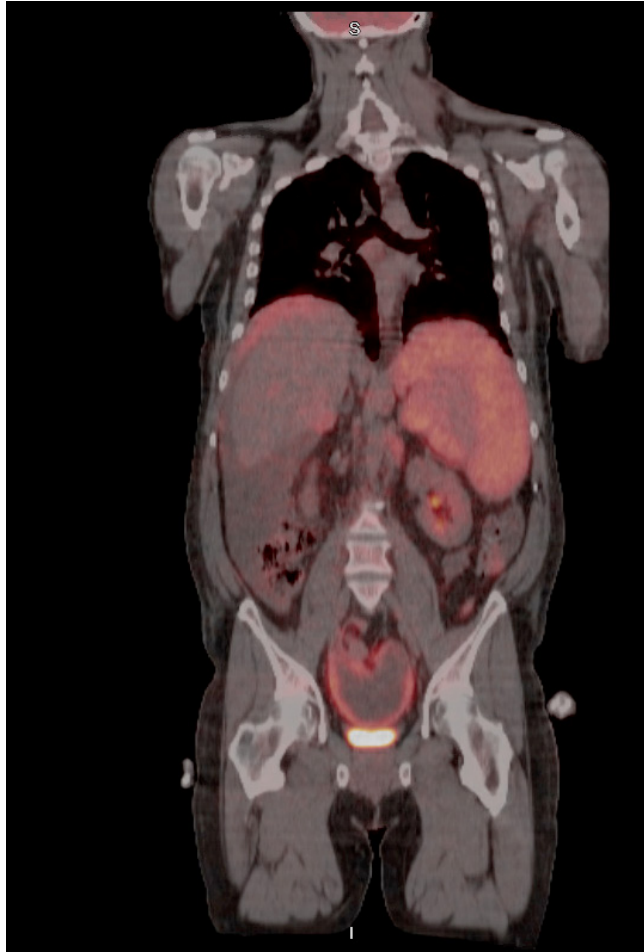


Figure 3: Coronal view: CT abdomen with perisplenic mass and right hemi diaphragmatic thickening along with omental caking.

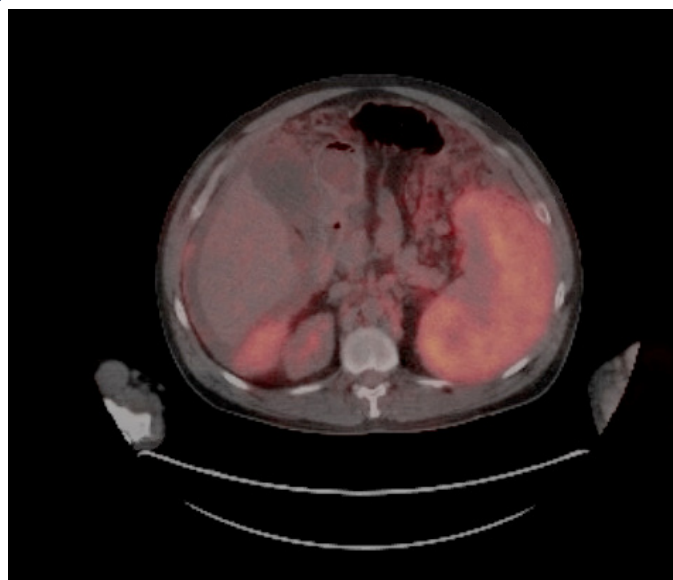


Figure 4: Transverse view: PET/CT with hypermetabolic perisplenic mass and right hemi diaphragmatic thickening.

A vigilant surveillance protocol is recommended for patients with favorable prognostic profiles, including regular imaging with CT of the chest, abdomen, and pelvis every 3-6 months for 5 years, followed by yearly follow-up until 10 years post-treatment. Conversely, tumors with high-risk features, such as elevated Ki-67, nodal metastasis, high tumor burden (PCI>17), or biphasic disease, may require systemic therapy before considering CRS+HIPEC.

Systemic therapy options encompass various chemotherapeutic agents, such as cisplatin, pemetrexed [13], and bevacizumab [14], along with immunotherapy using agents like nivolumab and ipilimumab [15]. Additional agents like gemcitabine and vinorelbine [16] may be utilized in specific clinical scenarios. Patients experiencing tumor progression following initial treatment may benefit from pemetrexed-based regimens or immunotherapy [17], guided by comprehensive molecular profiling to identify potential targetable mutations.

For patients with poor performance status (ECOG PS 3-4), supportive care measures are crucial for symptom management and palliation. These include interventions like paracentesis for ascites, symptom control for nausea, vomiting, and pain, as well as access to palliative care services aimed at optimizing quality of life.

Future directions

The advent of targeted therapies and immunomodulatory agents heralds a paradigm shift in the management of peritoneal mesothelioma. Comprehensive molecular profiling holds promise in identifying actionable genetic alterations and personalizing therapeutic interventions. Moreover, ongoing clinical trials investigating novel treatment modalities underscore the imperative of multidisciplinary collaboration and translational research in optimizing patient outcomes.

Conclusion

Peritoneal mesothelioma poses formidable challenges to clinicians and researchers alike, necessitating a nuanced understanding of its epidemiology, pathogenesis, and therapeutic landscape. Through concerted efforts in advancing diagnostic precision and therapeutic efficacy, we strive towards improving the prognosis and quality of life for affected individuals.

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