Case report

A CASE OF MALIGNANT PERITONEAL MESOTHELIOMA AND ACUTE KIDNEY FAILURE FOLLOWING VIRAL INFECTION IN A MANGANESE MINER

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Rezume Malignant peritoneal mesothelioma (MPM) is a rare cancer typically linked to asbestos exposure, but other environmental factors, such as manganese dust, may also increase risk. This case report describes a 56-year-old male with diabetes, arterial hypertension, and a history of long-term manganese mining exposure, who developed acute kidney failure and massive ascites after a viral infection. Despite initial treatment, his condition worsened, and MPM was diagnosed after analysis of bloody ascitic fluid. This case emphasizes the role of occupational exposure in the development of MPM and highlights the diagnostic challenges posed by nonspecific symptoms. Early detection and better therapeutic options are needed to improve outcomes for MPM patients.

Key words: Malignant Peritoneal Mesothelioma, kidney failure, massive ascites, manganese dust, asbestosis

INTRODUCTION:

According to the American Cancer Society, asbestos exposure is the main cause of pleural mesothelioma. About 8 out of 10 people with mesothelioma have been exposed to asbestos. When asbestos fibers are breathed in, they travel to the ends of small air passages and reach the pleura, where they can cause inflammation and scarring. This may damage cells' DNA and cause changes that result in uncontrolled cell growth. If swallowed, these fibers can reach the abdominal lining, where they may contribute to peritoneal mesothelioma. But most people exposed to asbestos, even in large amounts, do not get mesothelioma [1]. Malignant peritoneal mesothelioma (MPM) is a rare but aggressive tumor arising from the peritoneal mesothelial cells. While asbestos exposure is the most well-established risk factor, other occupational exposures, including exposure to various minerals and fibers, can also increase the risk of developing mesothelioma. This case presents a 56-year-old male with a history of diabetes mellitus (DM) and hypertension (HTN), who worked in a manganese mine for several years. The patient developed acute kidney failure, anuria, and massive ascites following a viral infection. Despite initial supportive treatment, the diagnosis of MPM was confirmed after diagnostic procedures.

CASE PRESENTATION:

A 56-year-old male with a history of DM, HTN, and a known long-term occupational exposure to manganese dust presented with progressive abdominal distention, anuria, and acute kidney failure. Ten days prior, the patient had experienced a viral upper respiratory infection, after which he developed these symptoms. The patient had worked in a manganese mine for over 25 years, which potentially contributed to his risk of developing mesothelioma. Additionally, the patient had been living with a Parkinson-like tremor for more than 15 years, a condition that might be linked to his chronic exposure to manganese, and a long-standing history of diabetes mellitus, further complicating his clinical presentation. His clinical course was marked by progressive worsening of renal function, requiring dialysis, and the development of significant ascites.

Initial treatment included diuretics, steroids, and albumin to manage fluid retention and renal failure. While partial diuresis occurred, with some improvement in urine output, the patient's condition continued to worsen. Ascites persisted, and despite adequate management, the patient's clinical status deteriorated further.

A CT scan confirmed the presence of ascitic fluid and peritoneal thickening (Figure 1), but despite appropriate diuresis, the ascites continued to increase. Peritoneal centesis was performed to analyze the ascitic fluid, which revealed bloody fluid. A biopsy confirmed the diagnosis of malignant peritoneal mesothelioma.

DISCUSSION:

This case emphasizes the importance of considering occupational exposure as a potential risk factor for malignant peritoneal mesothelioma (MPM), in addition to the well-established association with asbestos exposure. Although MPM is rare and its association with manganese exposure is not as well-established as with asbestos, some studies suggest that exposure to mineral dust, including manganese, can increase the risk of developing mesothelial tumors [2]. In this case, the patient's history of working in a manganese mine is an important factor to consider, as prolonged exposure to industrial dusts and fibers has been

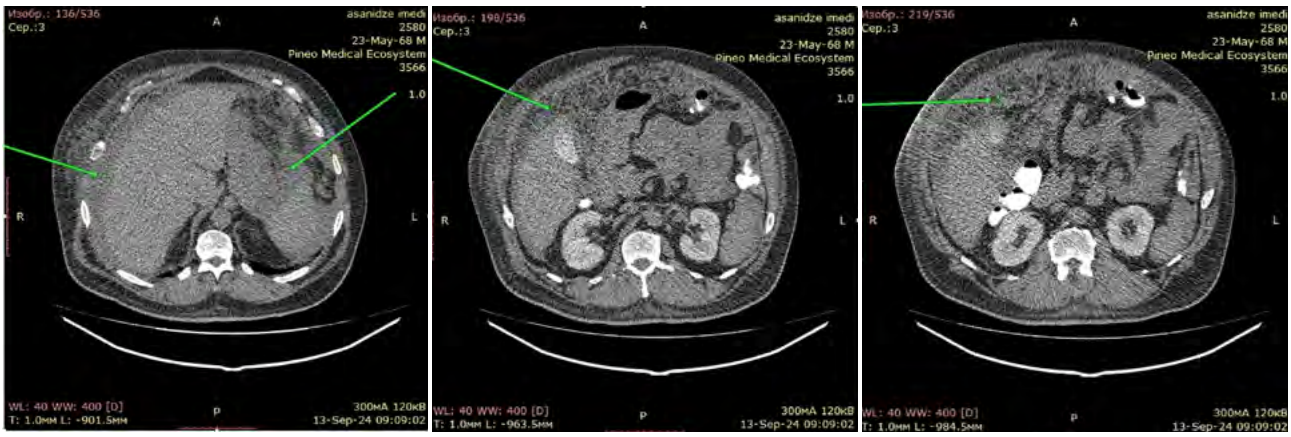

Figure 1. *CT scan shows massive ascites, and peritoneal thickening*

implicated in a variety of occupational lung diseases and malignancies, including mesothelioma. The exact mechanisms remain unclear, but it is believed that inhalation of certain particulate matter may lead to chronic inflammation or mesothelial cell damage, eventually leading to malignancy. Occupational exposure, particularly in industries such as mining, can pose a significant long-term risk to workers, even if the specific risk of MPM is lower than that of asbestos. According to the researchers Halina B. R llin and Claudina M. C. A. Nogueira, manganese is a natural element found in the environment, present in rocks, soil, water, air, and food. It's mainly used in steel production to make steel harder, and in many other industries, such as batteries, agriculture, ceramics, and glass. It's also an essential trace element for the body, helping with various biological functions and overall health. However, both too little and too much manganese can be harmful. Excessive manganese intake through breathing or swallowing can lead mostly to manganese buildup. In the brain, which causes brain damage and neurological problems. People working in industries like mining, welding, or steel production, where exposure to high levels of manganese is common, have been found to develop conditions like manganese poisoning and manganism (a disorder with symptoms similar to Parkinson's disease). There's growing concern about environmental manganese exposure as well, especially in vulnerable populations, although the full effects of lower levels of exposure are still unclear and require more research [3]. According to the literature, although less evidence directly links manganese exposure to peritoneal mesothelioma, it is plausible that manganese shares mechanisms with asbestos, especially with chronic exposure. Like asbestos, manganese can cause inflammation, oxidative stress, and DNA damage, which may contribute to cancer development. In occupational settings where both manganese and asbestos are present, the combined exposure could potentially heighten the risk of mesothelioma. Further research is necessary to fully understand the relationship between manganese and mesothelioma, but it is possible that manganese may contribute to the disease, particularly when combined with other environmental toxins [4].

Acute kidney injury (AKI) is a known complication of viral infections, particularly in individuals with pre-existing comorbidities such as diabetes and hypertension. The viral infection in this patient likely contributed to the renal dysfunction, possibly through direct viral effects or through an inflammatory response that exacerbated renal impairment. However, the persistent ascites and eventual identification of MPM suggest that the renal failure was likely compounded by the underlying malignant peritoneal disease rather than being solely attributable to the viral infection. MPM often presents with nonspecific abdominal symptoms, including distention and ascites, and can be easily confused with other causes of abdominal fluid buildup [5,6]. In this patient, ascites was one of the earliest signs, but its cause remained unclear initially. Despite partial diuresis and steroid treatment, the patient's condition deteriorated, which is consistent with the clinical progression of MPM, where peritoneal involvement leads to increasing ascites and organ dysfunction. The diagnosis of MPM in this case was delayed, highlighting the challenge of diagnosing this condition in its early stages, especially when initial biopsies fail to yield definitive results. Peritoneal centesis, revealing bloody ascitic fluid, was essential to suspect the diagnosis. The cytological examination revealed abundant mesothelial cells with pleomorphism, large nuclei, and prominent nucleoli. Immunohistochemical staining, which showed mesothelin-positive results confirmed the diagnosis of MPM.

MPM is often diagnosed at advanced stages due to its nonspecific presentation. In this case, an initial biopsy did not yield a clear diagnosis, necessitating a further diagnostic workup. The bloody ascitic fluid obtained through peritoneal centesis was a key diagnostic clue, prompting further investigation. Imaging modalities such as CT scans may reveal signs of peritoneal thickening or fluid accumulation, but definitive diagnosis often requires aspiration of the ascitic fluid or biopsy of affected tissues [7,8,9]. The treatment options for MPM are limited, particularly in advanced cases where the malignancy has led to signifi-

cant organ dysfunction. Modern treatment for advanced peritoneal mesothelioma includes: cytoreductive surgery (CRS), hyperthermic intraperitoneal chemotherapy (HIPEC), systemic chemotherapy, targeted therapy (e.g., VEGF inhibitors [e.g., bevacizumab]), and immunotherapy (e.g., checkpoint inhibitors [e.g., nivolumab]). Cytoreductive surgery combined with hyperthermic intraperitoneal chemotherapy (HIPEC) is the standard treatment approach in selected cases, but the prognosis remains poor [10,11,12,13]. In our case, the patient's renal failure, along with the worsening ascites despite diuretic therapy, suggests that the disease was far advanced at the time of diagnosis. The patient's prognosis is likely poor, and supportive care, including renal dialysis, may be the primary management approach.

The presented case highlights the importance of considering both occupational exposure and viral infections in the differential diagnosis of patients with abdominal distention and ascites. While viral infections can lead to acute kidney injury, the persistence of ascites despite treatment should raise suspicion for a peritoneal malignancy, particularly in patients with potential occupational risks. Cytology, along with immunohistochemistry, plays a vital role in diagnosing peritoneal mesothelioma, especially when ascitic fluid is available for analysis. Pathological findings, including the identification of mesothelial cell proliferation and distinctive cellular features, along with specific immunohistochemical markers, are crucial for confirming the diagnosis and differentiating MPM from other abdominal malignancies. Future research should focus on improving early detection methods for MPM, especially in populations with known occupational exposures, to improve the prognosis of this rare and aggressive cancer.

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ვირუსული ინფექციის შემდეგ მანიფესტირებული ავთვისებიანი პერიტონეალური მეზოთელიომისა და თირკმლის მწვავე უკმარისობის შემთხვევა მანგანუმის საბადოზე მომუშავე პირთან (შემთხვევის აღწერა)

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რეზიუმე

პერიტონეუმის მეზოთელიომა არის იშვიათი კიბო, რომელიც ძირითადად ასბესტთან დაკავშირებულია, თუმცა სხვა გარემო ფაქტორები, როგორიცაა მანგანუმის მტვერი, ასევე ზრდის ზ/ა განვითარების რისკს. სტატიაში აღწერილია 56 წლის მამაკაცის შემთხვევა, რომელსაც აქვს დიაბეტი, არტერიული ჰიპერტენზია. ანამნეზიდან ირკვევა ხანგრძლივი მუშაობა მანგანუმის საბადოზე. პაციენტს ვირუსული ინფექციის შემდეგ განუვითარდა თირკმლის მწვავე უკმარისობა, ასციტი. კომპლექსური მკურნალობის ფონზე მდგომარეობა არ გაუმჯობესდა, ჩაუტარდა ასციტური სითხის ციტოლოგიური გამოკვლევა, რითაც დადგინდა პერიტონეუმის მეზოთელიომა. ეს შემთხვევა ხაზს უსვამს მანგანუმის ზემოქმედების როლს მეზოთელიომის განვითარებაში. ავთვისებიანი პერიტონეუმის მეზოთელიომის დროული დიაგნოზი არის თანამედროვე მედიცინის დიდი გამოწვევა, მნიშვნელოვანია დაავადების დროული აღმოჩენა რათა მოხდეს მკურნალობის დროული დაწყება.

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