

Malignant Pleural Mesothelioma with Concurrent Pleural Plaques Following Occupational Asbestos Exposure: A Case Report

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Abstract

Malignant pleural mesothelioma (MPM) is an aggressive neoplasm primarily associated with occupational asbestos exposure and typically manifests decades after initial contact. We report the case of a 73-year-old Thai male presented with non-productive cough, progressive dyspnea and left-sided pleuritic chest pain for 3 months. He underwent medical thoracoscopy with pleural biopsy and was diagnosed with malignant pleural mesothelioma with pulmonary metastases. The patient had a 39-year occupational history as an asbestos processing operator in a roof-tile factory and had ceased asbestos exposure for over 10 years before developing symptoms. Imaging demonstrated a pleural mass, loculated effusion, and multiple calcified pleural plaques, while histopathology and immunohistochemistry confirmed MPM. Despite chemotherapy, his condition deteriorated, leading to palliative care. This case emphasizes the aggressive course of malignant pleural mesothelioma, the prolonged latency of asbestos-related disease, and illustrates that clinical manifestations can occur long after cessation of exposure. It highlights the urgent need for preventive policies, strict regulation of asbestos, and comprehensive occupational health strategies. Importantly, periodic health examinations and long-term surveillance of asbestos-exposed workers remain essential even after exposure cessation or retirement, to support early detection and strengthen preventive strategies.

Keywords: malignant mesothelioma; pleural plaque; asbestos-related disease; occupational disease; asbestos

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มะเร็งเยื่อหุ้มปอดร่วมกับปื้นใยหินจากการสัมผัสแร่ใยหินในการทำงาน: รายงานผู้ป่วย

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บทคัดย่อ

มะเร็งเยื่อหุ้มปอด (Malignant Pleural Mesothelioma; MPM) เป็นเนื้องอกร้ายที่มีความสัมพันธ์โดยตรงกับการสัมผัสแร่ใยหินและมักปรากฏอาการหลังการสัมผัสเป็นเวลาหลายสิบปี รายงานนี้นำเสนอผู้ป่วยชายไทยอายุ 73 ปี ซึ่งมาด้วยอาการไอแห้ง ๆ เหนื่อยมากขึ้นและเจ็บหน้าอกด้านซ้ายเวลาหายใจมาเป็นเวลา 3 เดือนผลการส่องกล้องตรวจเยื่อหุ้มปอดร่วมกับการตัดชิ้นเนื้อเยื่อหุ้มปอดเข้าได้กับโรคมะเร็งเยื่อหุ้มปอด ร่วมกับการแพร่กระจายเข้าสู่ปอด ผู้ป่วยมีประวัติการทำงานในโรงงานผลิตกระเบื้องมุงหลังคาในตำแหน่งที่สัมผัสแร่ใยหินเป็นระยะเวลา 39 ปี และหยุดสัมผัสแร่ใยหินมาแล้วกว่า 10 ปีก่อนเริ่มมีอาการ ผลการตรวจเอกซเรย์และภาพถ่ายรังสีวินิจฉัยพบก้อนที่เยื่อหุ้มปอด มีน้ำในเยื่อหุ้มปอดและปื้นใยหิน (Calcified pleural plaque) หลายตำแหน่ง ผลการตรวจทางพยาธิวิทยาและอิมมูโนฮิสโตเคมีช่วยยืนยันการวินิจฉัยมะเร็งเยื่อหุ้มปอดแม้ได้รับการรักษาด้วยเคมีบำบัด แต่อาการของผู้ป่วยทรุดลงและเข้าสู่การดูแลแบบประคับประคองในที่สุด รายงานผู้ป่วยนี้สะท้อนถึงความรุนแรงและการดำเนินโรคที่รวดเร็วของมะเร็งเยื่อหุ้มปอด รวมถึงระยะพักตัวที่ยาวนานจากการสัมผัสแร่ใยหินอีกทั้งยังแสดงให้เห็นว่าการเกิดโรคที่เกี่ยวข้องกับแร่ใยหิน (Asbestos-related diseases) สามารถเกิดขึ้นได้แม้จะหยุดสัมผัสมานานแล้ว รายงานนี้จึงตอกย้ำความจำเป็นเร่งด่วนของนโยบายป้องกัน การควบคุมแร่ใยหินอย่างเข้มงวดและมาตรการอาชีวอนามัยที่ครอบคลุม นอกจากนี้การตรวจสุขภาพเป็นระยะและการเฝ้าระวังระยะยาวอย่างต่อเนื่องในกลุ่มผู้ที่เคยสัมผัสแร่ใยหินยังคงมีความสำคัญแม้จะหยุดการสัมผัสแล้วก็ยังคงต้องมีการติดตามอย่างต่อเนื่องเพื่อช่วยให้สามารถตรวจพบโรคได้ตั้งแต่ระยะเริ่มต้นและเสริมสร้างมาตรการป้องกันที่มีประสิทธิภาพยิ่งขึ้น

คำสำคัญ : มะเร็งเยื่อหุ้มปอด; ปั่นไยหิน; โรคจากแร่ใยหิน; โรคจากการประกอบอาชีพ; แร่ใยหิน

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Introduction

Malignant pleural mesothelioma (MPM) is a rare and aggressive neoplasm primarily arising from mesothelial cells lining the pleura. It is often described as an insidious cancer due to its long latency period, typically between 20 and 40 years⁽¹⁾, which makes it a silent threat. Without treatment, median survival is generally less than one year.⁽²⁾ MPM is most strongly associated with asbestos exposure, particularly in occupational settings.⁽³⁾ Asbestos refers to a group of naturally occurring mineral fibers widely used in various industries due to their durability and heat resistance. All forms of asbestos have been classified by the World Health Organization (WHO) as carcinogenic to humans⁽⁴⁾ and linked to several cancers and chronic respiratory illnesses. When inhaled, asbestos fibers become trapped in the lower regions of the lungs, triggering chronic inflammation. These fibers are phagocytosed by mesothelial cells, initiating a cascade of oncogenic events that may eventually lead to malignant transformation. The World Health Organization (WHO) estimates that around 125 million individuals are exposed to asbestos in their workplaces worldwide, with over 107,000 deaths each year attributed to asbestos-related diseases.⁽⁵⁾ While many countries have enacted strict regulations or complete bans on asbestos

use, Thailand and several other developing nations continue to face challenges in controlling asbestos exposure.⁽⁶⁾ Industrial applications and insufficient enforcement of regulatory policies contribute to ongoing risks. Although Thailand does not have domestic asbestos mines, it imports asbestos from multiple countries for use in manufacturing, particularly for roof tiles, cement pipes, and shipbuilding. This case report aims to highlight the clinical presentation of mesothelioma in a Thai patient, explore the potential occupational risk factors, and underscore the urgent need for improved medical surveillance programs and stronger public health policies. It also aims to raise awareness among healthcare professionals and policymakers about the importance of early detection, intervention, and preventive strategies for effectively managing mesothelioma in Thailand.

Case report

A 73-year-old Thai male with well-controlled hypertension, hypercholesterolemia and previous cerebral infarction presented with a three-month history of non-productive cough, progressive dyspnea and left-sided pleuritic chest pain. He had a 30 pack-year history of cigarette smoking and had quit 3 years ago. He denied any history of tuberculosis diagnosis or contact. On physical examination, his

vital signs and oxygenation were normal with an SpO₂ of 98% while breathing room air. He was neither pale nor icteric. No superficial lymphadenopathy was palpated. Respiratory examination revealed decreased chest expansion, dullness to percussion, decreased tactile fremitus, and decreased breath sounds over the left lower hemithorax. Digital clubbing was also noted.

The chest radiograph (Figure 1) demonstrates preserved right lung volume, multiple calcified pleural plaques overlying both hemidiaphragms and superimposed over the lower chest wall bilaterally. A moderate amount of loculated left pleural effusion is also observed.

Ultrasound-guided left thoracentesis showed yellow, clear pleural fluid.

Biochemical analysis demonstrated an exudative profile with lymphocytic predominance (82%). Pleural fluid ADA was 9.6 U/L. PCR for *Mycobacterium tuberculosis* in the pleural fluid was not detected, and pleural fluid cytology was negative for malignancy.

Subsequent chest CT scan revealed a moderate amount of loculated left pleural effusion with markedly circumferential pleural thickening and a lobulated, contrast-enhancing pleural mass measuring approximately 5.7 × 3.6 cm was seen at the left diaphragmatic pleura. Multiple subcentimeter solid pulmonary nodules are seen in both lungs. No evidence of mediastinal lymphadenopathy is noted. Multiple calcified pleural plaques are more distinctly visualized on CT (Figures 2–4).

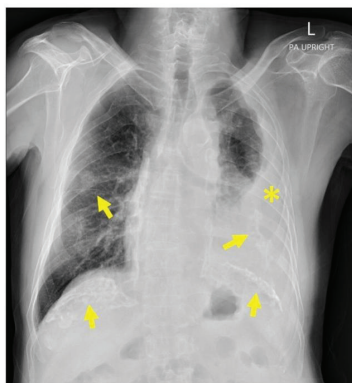


Figure 1 Posteroanterior upright chest radiograph shows a loculated left pleural effusion (asterisk) along with multiple calcified pleural plaques (arrows) involving both lower chest walls.

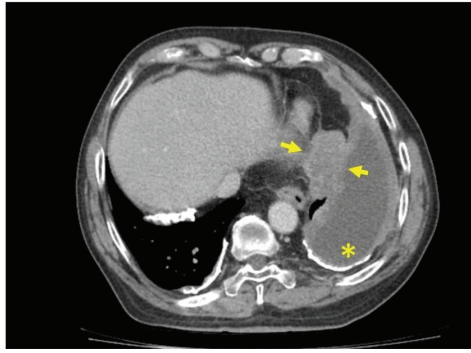


Figure 2 Axial chest CT in the post-contrast-enhanced mediastinal window demonstrates a contrast-enhancing pleural-based mass (arrow) measuring approximately 5.7 × 3.6 cm, located at the left diaphragmatic pleura. A moderate loculated left pleural effusion was also noted (asterisk).

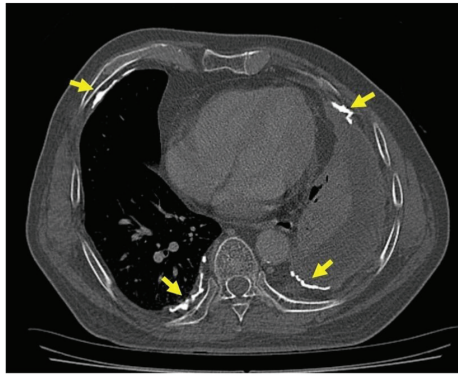


Figure 3 Axial non-contrast chest CT reveals calcified bilateral pleural plaques along the costal pleura at approximately the 11, 1, 5, and 7 o'clock positions (arrows).

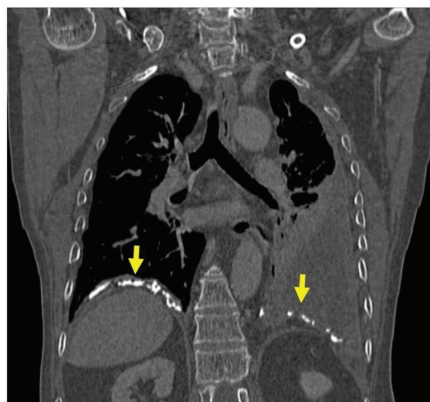


Figure 4 Axial non-contrast chest CT demonstrates bilateral calcified pleural plaques along both diaphragmatic pleura (arrows).

The patient underwent left medical thoracoscopy with pleural biopsy. Histopathological examination was compatible with atypical mesothelial proliferation. Further immunohistochemical staining confirmed the diagnosis of malignant mesothelioma, with positive markers for cytokeratin 7 (CK7), cytokeratin 5/6 (CK5/6), D2-40, calretinin, and Wilms' Tumor 1 (WT1), while remaining negative for Thyroid Transcription Factor-1 (TTF-1). The final diagnosis was malignant pleural mesothelioma with pulmonary metastases. He subsequently received neoadjuvant chemotherapy with pemetrexed and cisplatin. However, after the first chemotherapy cycle, he developed severe sepsis secondary to chemotherapy-induced febrile neutropenia, and his overall condition progressively deteriorated. A family meeting was arranged, and following counseling, the patient and his family chose palliative care as the goal of treatment. He died one year after the diagnosis.

Occupational history

His occupational history revealed that he had worked for 39 years at an asbestos-containing roof tile manufacturing factory in Thailand, where he operated

an asbestos processing machine. His responsibilities included preparing materials for roofing production, including cutting, crushing, and mixing asbestos. He worked 8 hours per day, 5 days a week, and occasionally wore a simple mask, which provided minimal protection against asbestos dust. He retired at the age of 63.

This study was approved by the Institutional Review Board (IRB) of Saraburi Hospital (EC048/2568). Certification Date: 27 June 2025.

Discussion

This case illustrates the classic presentation of malignant pleural mesothelioma (MPM) in a prolonged asbestos-exposed worker. The patient's 39-year occupational history as an asbestos processing operator, combined with imaging findings of multiple calcified pleural plaques, and loculated pleural effusion. Pleural plaques, in particular, are the most common manifestation of asbestos exposure, typically appearing decades after the onset of exposure.⁽⁷⁾ In this patient, the computed tomography (CT) scans showed calcified pleural plaques, a hallmark of asbestos exposure, along with a pleural mass suspicious for malignant mesothelioma. These radiographic findings, in conjunction with the patient's extensive

exposure history, raised a strong clinical suspicion for mesothelioma and directed the subsequent diagnostic approach. MPM is notorious for its protracted latency and diagnostic challenges. The interval between initial asbestos exposure and the development of mesothelioma is typically on the order of 20–40 years. This long latency explains why our 73-year-old patient presented with the disease decades after his occupational exposure. In addition, previously reported cases from the same factory, including one case of asbestosis and two cases of MPM, further support occupational causation and raise concern for a possible workplace cluster.⁽⁸⁻⁹⁾

In roof tile manufacturing, exposure may occur during fiber handling, mixing, cutting, and mechanical processing of asbestos-cement materials. Although respiratory protective equipment may have been provided, its effectiveness depends on filtration efficiency, proper fit, and enforcement. Surgical masks provide negligible protection against respirable asbestos fibers, and even disposable respirators may not achieve adequate protection without formal fit testing and appropriate high-efficiency filtration (e.g., P100/HEPA).⁽¹⁰⁾ Over 39 years

of occupational exposure, inadequate respiratory protection could have resulted in persistent low-level inhalation and a significant cumulative asbestos burden.

Clinically, MPM often presents with nonspecific symptoms such as dyspnea, chest pain, and pleural effusions⁽¹¹⁾, which can mimic benign conditions and delay diagnosis. In regions like Thailand, where tuberculosis is prevalent, an exudative pleural effusion may initially be misattributed to tuberculous pleuritis, further complicating and delaying the identification of mesothelioma. A definitive diagnosis requires invasive tissue sampling and immunohistochemical analysis, as was performed in this case. The tumor's immunophenotype (CK7 +, CK5/6 +, D2-40 +, calretinin +, WT1 focal +, and TTF-1 negative) is characteristic of pleural mesothelioma⁽¹²⁾, demonstrating positivity for mesothelial markers while lacking thyroid transcription factor-1, which is typically seen in lung adenocarcinoma. This immunohistochemical confirmation is essential, as it distinguishes MPM from metastatic pleural carcinomas and other malignancies, thereby guiding appropriate management. The patient's history and findings also highlight the continuing impact of

occupational asbestos exposure in Thailand. Crucially, this could be the very first reported case of MPM in Thailand with evidence of potential past asbestos exposure, that is, the presence of pleural plaques. Asbestos (primarily chrysotile) has been widely used in the Thai industry for several decades, especially in roofing, cement, and insulation materials. Thailand remains among the world's top consumers of asbestos, historically importing tens of thousands of tons annually⁽¹³⁾. Despite the well-documented health risks of asbestos, regulatory control in Thailand has been limited. A national mandate to ban asbestos was approved in principle by the cabinet in 2011⁽¹⁴⁾, but it has not been fully implemented or enforced due to strong industrial and political resistance. Consequently, chrysotile asbestos is still used in manufacturing (e.g., in the production of roof tiles and brake linings), and workers continue to be exposed to it. The combination of high past consumption and long disease latency suggests that Thailand may face an increasing number of mesothelioma and other asbestos-related disease cases in the coming years. Another critical issue highlighted by this case is the under-recognition and under-reporting of asbestos-related

diseases in Thailand. Historically, very few cases of mesothelioma have been officially reported in Thai medical literature. One report noted that, depending on the source, Thailand had either only a handful of documented asbestos-related illness cases or potentially up to 1,000 cases per year in reality.⁽¹⁵⁾ This discrepancy is likely due to diagnostic challenges, limited awareness, and the lack of a robust occupational disease surveillance system. Many cases may go undiagnosed or misdiagnosed because confirming mesothelioma requires specialized pathology resources (immunohistochemistry) that might not be readily accessible for all patients. Indeed, the absence of a comprehensive national registry for mesothelioma and asbestosis has impeded understanding of the actual burden. Improved reporting and mandatory notification of occupational illnesses would help bridge this gap, ensuring that cases like this patient's are recognized as occupational diseases and prompting compensation and prevention efforts.

From a public health and occupational medicine perspective, this case underlines the urgent need for stronger preventive measures. As an incurable but entirely preventable cancer, MPM represents a lack of primary prevention

when it occurs. Thailand's experience mirrors that of many countries that initially used asbestos without adequate safeguards and are now facing its health consequences. A total ban on asbestos importation and use is a critical step to halt new exposures and eventually end the epidemic of asbestos-related diseases.⁽⁵⁻⁶⁾ In parallel, there must be enhanced efforts in medical surveillance and early detection for workers with a significant history of asbestos exposure. Early identification of cases – although challenging due to the disease's aggressive nature – could help initiate timely palliative treatments and improve quality of life. It is also essential to educate healthcare providers on eliciting occupational histories in patients with pleural diseases, so that diagnoses like mesothelioma are considered early. Lastly, strengthening occupational health regulations and reporting systems will ensure that cases are documented and analyzed, thereby informing public health interventions.

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