



# Prostate Cancer with Concurrent Endobronchial Metastasis: A Case Report and Literature Review

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## Abstract

Synchronous presentation of endobronchial metastasis from prostate cancer is exceedingly rare. We describe a case of endobronchial and bone metastasis secondary to prostate cancer in a patient who presented with pulmonary symptoms and generalized back pain. Bronchoscopy and biopsy of the endobronchial mass were performed along with immunohistochemical staining for prostate-specific antigen which confirmed the diagnosis. Imaging revealed metastatic lesions of the vertebrae, ribs, and pelvis with pathologic fractures of the lumbar vertebrae. Multimodal therapy including androgen deprivation therapy, radiation, and chemotherapy led to significant improvement of his respiratory symptoms.

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## Introduction

While the overall incidence of prostate cancer is decreasing, the incidence of metastasis at diagnosis is increasing and less than one-third of men with metastasis at diagnosis survive five years after diagnosis [1]. The most common sites of metastases from prostate cancer are the bone, distant lymph nodes, and liver, respectively. Less common areas include the thorax, brain, and digestive system [2]. Endobronchial Metastases (EBM) is a rare location for prostate metastases. The most common primary tumors of EBM are breast, colon, and kidney [3].

## Case presentation

A 53-year-old Caucasian male with no previous cancer diagnosis presented with dyspnea on exertion and acute worsening of back pain. He had a previously history of transurethral resection of the prostate for benign prostatic hyperplasia 2 years prior. On exam, he had tachypnea, tenderness to palpation of the lumbar region, and pitting edema of the bilateral lower extremities. Digital rectal exam demonstrated an irregular prostate with no definitive mass. PSA was elevated at 733 ng/mL.



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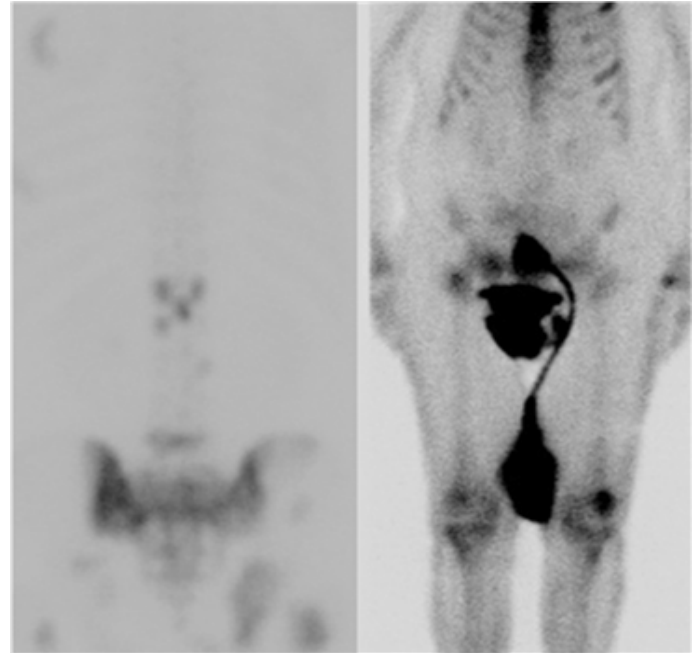
Chest radiography revealed bilateral perihilar and peripheral reticular opacities. Computed tomography scan of the chest demonstrated a right hilar mass, multiple pulmonary nodules, right hilar adenopathy, and multiple bilateral pulmonary emboli (**Figure 1**). Multiple osteoblastic and osteolytic metastases were visualized in the lumbar bodies, pelvic bones, and right hip, and healed pathological fractures of the posterior right ribs. MRI of the lumbosacral spine demonstrated posterior epidural expansion at L1/L2 and a soft tissue mass obliterating the sacral canal at S2-S5. Bone scan showed increased radiotracer uptake in five ribs bilaterally, the cervical and lumbosacral spine, left femur and pelvis (**Figure 2**).

Flexible bronchoscopy was performed as primary lung cancer was initially suspected which revealed an endobronchial tumor in the right upper lobe bronchus occluding the right upper lobe anterior and posterior segments and an endobronchial tumor in the right middle lobe medial segment. Immunohistochemistry from endoscopic ultrasound-guided fine needle aspiration was positive for PSA and prostate specific acid phosphatase, and negative for NKX3.1 and PAX8 (**Figure 3**). The biopsy tissue specimen revealed a malignant neoplasm invading bronchial tissue. Immunohistochemistry was diffusely positive for PSA and rarely positive for NKX3, while thyroid transcription factor-1, napsin A, GATA3, synaptophysin, chromogranin, neuron-specific enolase, cytokeratin 7 and 20 (CK7, CK20), PAX8, and CD45 were negative, suggestive of prostate cancer with endobronchial metastases.

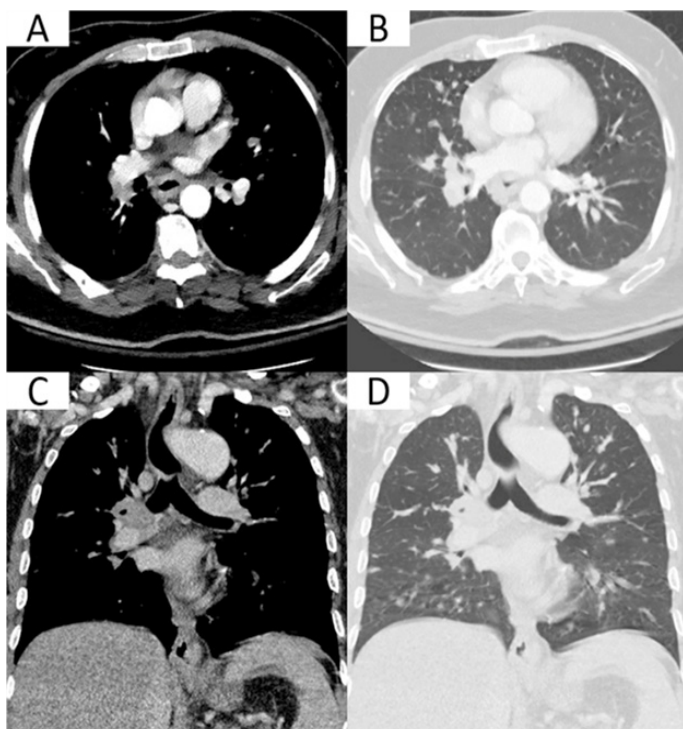
The patient was started on enoxaparin given his pulmonary emboli. He was treated urgently with immediate initiation of Androgen Deprivation Therapy (ADT) and radiation therapy of five fractions per week of 400 centigray to the lumbosacral spine. Although spinal cord compression was not suspected, dexamethasone was administered to relieve neuropathic pain secondary to nerve compression. The patient's PSA dropped from 733 to 14 ng/dL after 6 weeks with ADT and radiation therapy.

Due to high volume metastatic disease, he was initiated on docetaxel. Denosumab with calcium and vitamin D supplementation were also administered.

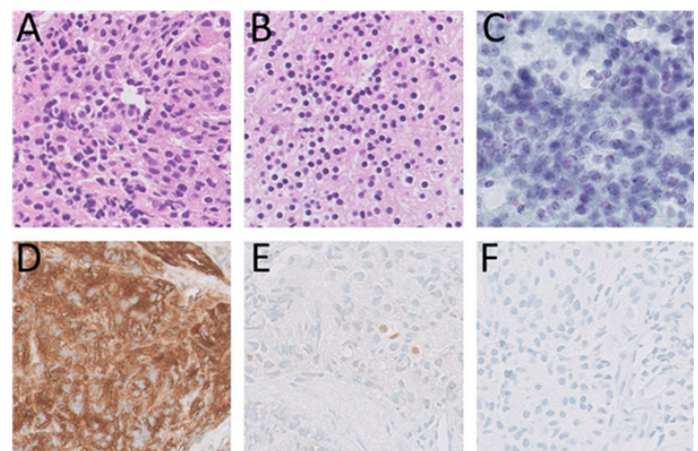
The patient's respiratory symptoms significantly improved over the course of treatment. His inpatient course was complicated by urinary retention likely secondary to sacral invasion of the neoplasm for which he required an indwelling catheter. One year and three months later the patient had a repeat bone scan that showed decreased uptake (**Figure 2**). He continues to have mild dyspnea on exertion, requires a suprapubic catheter due to neurogenic bladder, and participates in a physical rehabilitation program for chronic back pain.



**Figure 2:** Initial bone scan (left image) showing uptake within the bilateral ribs (visibility of uptake within left ribs limited by image quality), lumbosacral spine, right inferior pubic ramus, right hip, lesser trochanteric region of the left and right hip, right greater than left iliac wings. Bone scan 15 months later (right image) showing uptake in the same regions albeit slightly decreased from previous examination with no new foci of abnormal radiotracer uptake. Of note, there is leakage of tracer around the suprapubic catheter onto the pelvis.



**Figure 1:** Pre-treatment chest computed tomography in axial (A,B) and coronal (C,D) views show a right hilar mass with associated lymphadenopathy. Lung windows (B,D) reveal multiple bilateral pulmonary nodules.



**Figure 3:** Bronchial tissue specimen and cytology. Hematoxylin and eosin stain of tissue biopsy and cytology, respectively (A,B), Papanicolaou stain (C), positive labeling of tissue with prostate-specific antigen (D), weakly positive labeling of tissue with NKX3.1 (E), negative labeling of tissue with thyroid transcription factor-1 (F). Magnification 40X.

## Discussion

Over 80% of all metastasis from prostate cancer are to the bone, with only 9% involving the thorax, and far fewer occurring within the tracheobronchial tree [2,3]. The clinical presentation of Endobronchial Metastasis (EBM) is variable and presents similarly to bronchogenic malignancies with the most common symptoms including cough, dyspnea, and hemoptysis. The majority of extrathoracic EBM are from breast, kidney, and colorectal primary sites, with prostate cancer representing only 1.9% of all cases. The right lung bronchus is the most frequent site of involvement [3]. The present case involved EBM in the right upper lobe bronchus. Chest imaging and bronchoscopy to evaluate the tracheobronchial tree, lymph nodes, and extent of tumor invasion is the cornerstone in initial workup. Approximately 4% of all bronchoscopies conducted to investigate suspected lung malignancy may reveal endobronchial tumors [3]. Endobronchial ultrasound can be utilized to guide fine needle aspiration of suspicious endobronchial masses.

The presentation of concurrent prostate cancer and EBM diagnosis is exceedingly rare with only two other reported cases of synchronous osseous metastasis in addition to EBM secondary to prostate cancer [4,5]. The indolent nature of prostate cancer may explain the advanced presentation, with a protracted sub-clinical course allowing time for systemic tumor dissemination.

The patient's complaints of back pain and dyspnea and chest radiography findings were most suggestive of primary lung cancer with bone metastasis. However, immunohistochemistry for PSA allowed the confirmatory diagnosis of prostate cancer metastases. Interestingly, the stain for *NKX3.1*, a gene expressed in the prostate that encodes for a homeodomain transcription factor, was only weakly positive.

Treatment data is limited in other cases of prostate cancer with concurrent EBM. However, this case is the first to include chemotherapy, radiation, and hormonal therapy in the treatment regimen. Outcome data is also limited however one study reports remission after approximately one and a half years in a patient treated with docetaxel and ADT [4].

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