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## Case Report

# Metastatic adenocarcinoma of the prostate presenting as a solitary cystic brain mass <sup>☆</sup>

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### ABSTRACT

Carcinoma prostate is the second most common cancer in men after skin cancer. It is the most common visceral malignancy in the United States of America. Like any other cancerous lesion, it has the propensity to metastasize to any part of the body; the most common locations being bones, lymph nodes, liver, and thoracic organs. However, it rarely metastasizes to the brain. It is even rarer for brain metastases to manifest as cystic lesions. We describe an unusual case of a metastatic prostate carcinoma presenting as a cystic brain mass.

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## Introduction

A 74-year-old man with a history of metastatic prostate cancer and known lung mass presented with four weeks of vertigo. He also complained of severe throbbing headaches associated with nausea and vomiting. MRI brain revealed a solitary cystic left cerebellar hemisphere mass measuring 3 cm. Given the presentation and imaging findings, the mass was initially presumed to be a primary brain neoplasm; possibly a hemangioblastoma. The patient underwent angiography followed by left-sided suboccipital craniectomy with tumor resection. Frozen pathology was consistent with adenocarcinoma. Final pathology confirmed metastatic prostate cancer. Although ex-

ceedingly rare, carcinoma of the prostate can present as solitary brain mass mimicking primary brain tumor.

## Case presentation

A 74-year-old man with history of metastatic prostate cancer with known lung mass presented with four weeks of vertigo. Around 4 weeks prior to presentation, the patient had begun noticing progressive difficulty with ambulation and a sensation as if "the floor was wobbling" and "the room was swaying." Due to his symptoms, he had significant difficulty ambulating. A few days before presentation, his symptoms acutely

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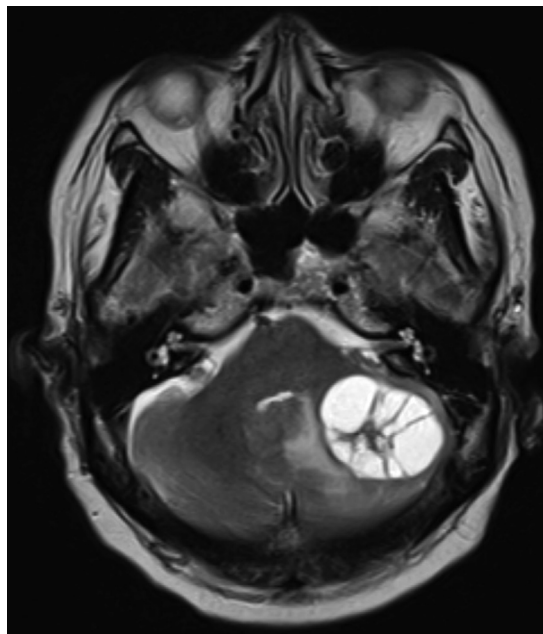
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worsened with development of progressively severe throbbing bifrontal headaches associated nausea and vomiting. Initially he was evaluated at an outside hospital emergency department (2 days prior to admission) where he tested positive for adenovirus. At that time, his symptoms were thought to be related to acute respiratory viral illness and he was discharged after receiving intravenous fluids, acetaminophen, and ondansetron. However, his symptoms continued unabated and the patient presented again to the emergency department. His prior medical history was notable for stage III prostate cancer diagnosed in 2013 (Gleason 6-7 disease) treated with prostatectomy and adjuvant radiation, with subsequent follow-up in 2016 revealing bilateral lung nodules and sclerotic bone lesions. In 2020, he was found to have left upper lobe lung lesion; biopsy was consistent with mismatch repair deficient and androgen receptor positive metastatic prostate cancer. He was initially started on enzalutamide which was changed to abiraterone acetate and prednisone after he developed hemoptysis and shortness of breath. Due to imaging concern for progression of left lung mass, the patient was also started on palliative radiation. He had been following 1 of 9 closely with his oncologist and had plans for further discussion about the possibility of additional chemotherapy or immunotherapy. On presentation to the emergency room, the patient was hemodynamically stable with a temperature of 37°C, heart rate 90 beats/min, blood pressure of 164/81 mm Hg and saturating 93% on room air. Physical exam was without any gross focal motor or sensory deficits, no pronator drift, and negative Babinski and Romberg's sign. Dysdiadochokinesia and finger-to-nose test were intact. Heel-to-shin test was negative. The patient's gait was intact though he endorsed some difficulty due to dizziness. Sensation to temperature, proprioception and light touch was intact. Dix-Hallpike's maneuver was positive on the right side with horizontal nystagmus.

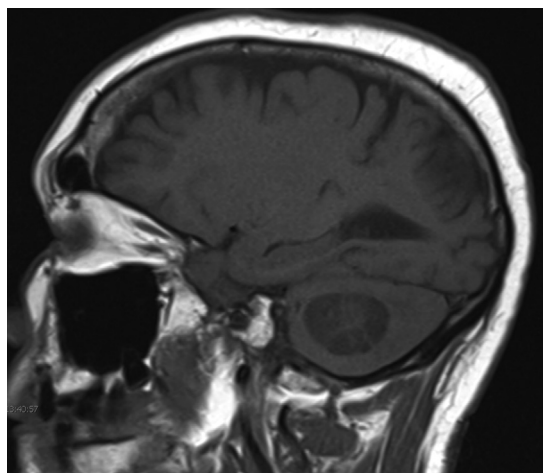
Non contrast CT head done on presentation showed a left cerebellar hemispheric mass measuring approximately 3 cm in diameter with vasogenic edema causing mild partial effacement of the fourth ventricle and partial effacement of the left quadrigeminal cistern concerning for a neoplasm. The patient received 4 mg of dexamethasone due to the presence of edema. MRI revealed a cystic enhancing cerebellar mass with mass effect secondary to edema (Figs. 1 and 2). No other areas of intra-axial enhancement were identified on the MRI.

A hemangioblastoma was considered the top differential given the posterior fossa location of the mass and the patient's age. Other differentials included metastases. An infarct, an initial differential of concern on the CT scan, was ruled out by the MRI.

As hemangioblastoma was the main differential, the patient initially underwent cerebral angiogram with possible embolization if necessary. The angiogram however was not significant for abnormal hyperemia at the location of the tumor. The next day patient underwent a left-sided suboccipital craniotomy with tumor resection. A friable cystic-yellow tumor was resected. Frozen pathology was consistent with adenocarcinoma. Final pathology confirmed the mass to be metastatic carcinoma with immunophenotype supportive of known prostate primary origin. Sections demonstrated cerebellum involved by sheets of tumor cells with ovoid nuclei, smooth chromatin, moderate cytoplasm (Fig. 3). There was ex-



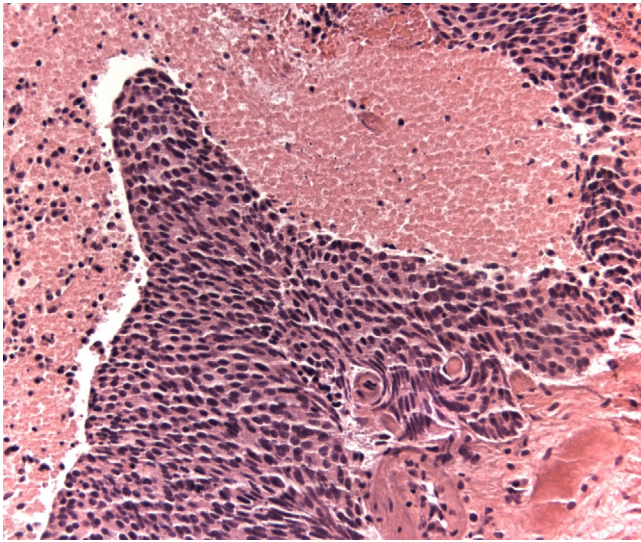
**Fig. 1 – MRI brain axial view T2 image demonstrating the tumor.**



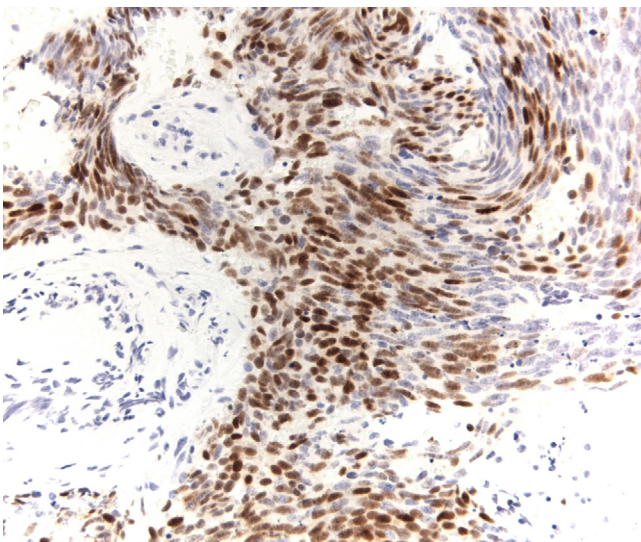
**Fig. 2 – MRI sagittal view T1 image demonstrating the tumor.**

tensive necrosis. Immunohistochemical stains for pancytokeratin and NKX3.1 were diffusely positive in the tumor cells supporting the diagnosis (Fig. 4). The patient tolerated the surgery well and was discharged home on the third postoperative day.

On his outpatient follow up on the 13th postoperative day, his ambulation had returned to his baseline. Dizziness and headaches have completely resolved. He is currently undergoing CyberKnife radiation treatment and being closely followed by his oncologist.



**Fig. 3 – High power (200x) Image demonstrating metastatic prostate carcinoma.**



**Fig. 4 – NKX3.1 immunohistochemical stain showing positive nuclear staining in tumor cells, consistent with metastatic prostate carcinoma.**

## Discussion

Prostate cancer can metastasize to any part of the body. Most common sites of metastasis are bone, lymph nodes, liver, and the thorax [1]. Metastasis to brain is an extremely rare phenomenon. A retrospective study showed only 1.6% of prostate tumors metastasized to brain [2]. There are different histologic types of prostatic cancer: adenocarcinoma, small cell carcinoma, squamous cell carcinoma, cribriform type, and few others. Most common histologic subtype of prostate cancer is adenocarcinoma accounting for about 99% of cases. It is interesting to note that despite adenocarcinoma being the most

common type of prostate cancer, it is not the most common histologic type of prostate cancer to metastasize to the brain [2–4]. Brain metastasis from prostate cancer presenting as a cystic tumor as seen in our patient is also a rarity. As per one case report only about 12 cases have been reported previously [3]. Several reports have shown that small cell histologic type has high rates of metastasis to the brain [4,5]. The exact mechanism of prostate cancer metastasis is unclear, but several theories have been proposed. Hematogenous spread can occur via the paravertebral venous plexus. Another theory is paradoxical tumor emboli passing through patent foramen ovale and eventually cancer cells reaching the brain [6]. Patients can have varying neurological symptoms ranging from headache to focal neurological deficits. Imaging of the brain is only recommended in symptomatic patients and is not done routinely. Metastatic prostate tumors can often be confused with primary brain tumors especially when it is a solitary lesion. There have been several reports where the mass was initially thought to be meningioma and later revealed as prostate cancer on histology. Even in our patient, it was initially thought to be hemangioblastoma based on the radiologic findings given his age and the tumor location, although possibility of metastasis was not excluded. There is not a lot of data available regarding the prognosis due to the rarity of the case. Few studies have shown 1 year survival rate after the diagnosis was less than 10 months [7].

## Conclusion

Although extremely rare, prostate cancer can metastasize to the brain. Imaging of the brain is only recommended in patients with neurological symptoms and is not routinely advised in the management of prostate cancer. Metastatic solitary prostate tumors to the brain can often be confused with primary brain tumors such as meningioma and hemangioblastoma as in our case, so we should have a high index of suspicion as the management is entirely different.

## Patient consent

I state that written and informed consent was taken from the patient for publication of this case. The patient was informed that no personal details will be revealed in the publishing of this case.

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