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Case Report

Incidental finding of metastatic prostatic adenocarcinoma of frontotemporal bone presenting as subdual hematoma: A case report and review of literature

Kuang-Ting Liu [a,b,1], Yueh-Ching Chang [a,b,1], Junn-Liang Chang [a,c,d,*]

[a] Department of Pathology and Laboratory Medicine, Taoyuan Armed Forces General Hospital, Taoyuan City, Taiwan
[b] Hsin Sheng Junior College of Medical Care and Management, Taoyuan City, Taiwan
[c] Department of Biomedical Engineering, Ming Chuan University, Taoyuan City, Taiwan
[d] Department of Pathology, Tri-Service General Hospital, National Defense Medical Center, Taipei City, Taiwan

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ABSTRACT

Introduction: and important: Prostatic cancer is often prone to metastasis and bone invasion. Skull metastasis in prostate cancer is uncommon, accounting for less than 2% of all metastases. However, frontotemporal bone metastasis without dural or brain metastasis is rare.

Case presentation: Herein, we report the case of a 91-year-old male patient who presented with a sudden-onset dizziness, a fall to the ground, and gradual loss of consciousness. Computed tomography (CT) of the brain revealed an aggressive bony lesion secondary to locally advanced metastatic malignancy and subdural hematoma. Subsequently, he underwent decompressive craniectomy. Histopathological and immunohistochemical (IHC) examinations demonstrated metastatic prostatic adenocarcinoma (PCa). Although after treatment by a multidisciplinary team, unfortunately, the patient expired two months after the surgery and could no longer be traced.

Clinical discussion: In the majority of reported cases, CT scans of the brain are often mistaken for subdural hematoma or meningioma. The present case suggests is a preliminary incidental case of a single frontotemporal bony lesion. This is the first case described in the literature of incidental finding of metastatic PCa presenting with asymptomatic characteristics.

Conclusion: Awareness of the possibility of metastatic PCa involving the skull bones, as well as histopathological and IHC examinations, are important to arrive at a correct initial diagnosis.

1. Introduction

Prostatic cancer is the most common cancer in men and is one of the leading causes of death in men. Prostate cancer metastasis is frequently observed in the axial skeleton, and skull bone metastasis in prostatic adenocarcinoma (PCa) is extremely rare, accounting for less than 2% of all metastases. It often invades the base of the skull and has diverse clinical manifestations to preferentially cause urological symptoms or multiple cranial nerve palsies, otological symptoms, and ophthalmoplegia, especially bone pain or cranial deficits [1–5].

Previous reports have documented skull metastases from all types of primary cancers, the most common being breast, lung, prostate, and thyroid cancers [1,3,5]. As the treatment of patients with advanced bony tumors is more effective and the life expectancy is longer, an increasing number of imaging studies have found skull bone metastasis. Prostatic PCa, despite its remote location, is the second most common primary tumor that metastasizes to the skull. Most skull bone metastases are purely intraosseous lesions limited to the calvarium or base of the skull [6]. A review of previous reports and literature revealed that metastatic prostate cancer of the temporal bone is rare, especially in the frontotemporal bone [1–15].

According to our knowledge and a review of the literature, this is the first report of a 91-year-old man with occult prostate cancer presenting as an incidental finding of metastatic PCa of the right frontotemporal

* Corresponding author. Department of Pathology and Laboratory Medicine, Taoyuan Armed Forces General Hospital, 32551, No.168, Zhongxing Rd., Longtan Dist., Taoyuan City, Taiwan.
E-mail addresses: shaintane@gmail.com (K.-T. Liu), id6231@ms23.honey.net (Y.-C. Chang), doc303@aftygh.gov.tw (J.-L. Chang).
[1] These authors contributed equally to this work.

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bone diagnosed incidentally after a fall, causing subdural hemorrhage with no otological or cranial neurological deficits. This study aimed to review the diagnostic and therapeutic challenges associated with the management of patients with metastatic prostatic adenocarcinoma (PCa).

The work has been reported in line with the SCARE 2020 criteria [16].

2. Case presentation

A 91-year-old man collapsed due to a sudden-onset dizziness and change in consciousness and was transfer by ambulance to our hospital emergency department.

On admission, his vital signs were as follows: body temperature, 37.5 °C; pulse rate, 98/min; respiratory rate, 19/min; and blood pressure, 86/64 mmHg. The laboratory findings were as follows: hemoglobin, 9.4 g/dL; hematocrit, 26.3%; and C-reactive protein, 9.22 mg/dL. Biochemical analysis showed a glucose level of 210.2 mg/dL. According to his family, patient had no smoking, alcohol, and recreational drug use. He had no past or recent traumatic, no surgical history or obvious head injury. Real-time polymerase chain reaction for SARS-CoV2 test was negative. The patient had a history of bladder stone and benign prostatic hyperplasia with mild lower urinary tract symptoms, valvular heart disease, coronary artery disease with congestive heart failure, atrial fibrillation with regulation medications, and no any drug allergy. His family history is non-contributing and had no history of genetic disease. At triage, a Glasgow Coma Scale (GCS) of E3V1M5 was accompanied by anisocoria and bilateral Babinski signs. The clinical symptoms were most likely intracranial lesions. A non-contrast computed tomography (CT) scan of the brain revealed acute subdural hemorrhage over the bilateral fronto-temporo-parietal regions, with compression of the cerebral tissue and a midline shift to the left (Fig. 1A). The right side was more pronounced than the left side. Simultaneously, we found a suspicious osteoblastic lesion over the right frontotemporal bone (Fig. 1B), and a probable distant metastasis to the frontotemporal bone was suspected.

The surgical options were explained to the patient's family, and they chose Burr hole craniostomy. After the operation, the patient's GCS score improved to E4VTM5. However, due to aspiration pneumonia, tracheal extubation was not performed until the sixth day after surgery. Unfortunately, the patient's consciousness gradually deteriorated. Repeated non-contrast brain CT scans showed persistent bilateral subdural hematomas, despite subdural drainage on the right side, systemic cerebral edema, and a midline shift to the left.

An emergent decompressive craniectomy revealed a suspicious bone tumor in the right frontotemporal region (Fig. 2A), and excision was performed. Subsequently, a massive hematoma over subdural space was also evacuated (Fig. 2B).

2.1. Histopathologic examination

The excised specimen submitted for histopathologic examination consisted of a bony fragment measuring up to 7.5 × 7 × 6.5 cm and a dark brownish colored central irregular osteoblastic lesion measuring 6 × 5.5 × 0.4 cm. Microscopically, the osteoblastic bony lesion showed a moderately differentiated metastatic adenocarcinoma composed of tubulo-glandular architectures lined with cuboidal or columnar neoplastic cells, forming cribriform and infiltrative growth patterns interspersed with bony trabeculae (Fig. 3A and B). In immunohistochemical (IHC) studies, the malignant cells demonstrated diffusely positive immunoreactivity for pan-cytokeratin (CK) (Fig. 3C) and prostate-specific antigen (PSA) (Fig. 3D), and CK18. Negative immunostaining was also observed for CK7, CK20, TTF1, CD45, and HMB45. Moderately differentiated metastatic adenocarcinoma of prostatic origin was first considered. According to the final pathological diagnosis, subsequent rapid serological tests showed a significant increase in PSA level (81.345 ng/mL; normal reference value ≤ 4 ng/mL); the free PSA level was 11.715 ng/mL, and the PSA ratio was 14.4. This was consistent with the possibility of secondary metastasis of PCa to the frontotemporal bone. This case report has been reported in line with the SCARE Criteria [16].

The patient was advised to undergo further evaluation, but his relatives refused these investigations as the patient's consciousness did not improve after decompressive craniectomy. Two weeks after the operation, repeated non-contrast brain CT scans showed low-density changes in the bilateral fronto-temporo-parieto-occipital regions and pons; the ischemic change and subdural hematoma on the left fronto-temporo-parietal convexity were markedly resolved. Eventually, tracheotomy was performed to remove the ventilator. One month after the operation, the patient was transferred to the respiratory care ward for continuous care. Unfortunately, the patient expired two months after the surgery and could no longer be traced.

3. Discussion

Skull bone metastasis of PCa is rare, accounting for less than 2% of all metastases, and it commonly invades the skull base. Skull base metastases from distant malignancies occur in 4% of patients with cancer [17]. Prostatic cancer is the leading cause of skull metastases in men, accounting for 12%–18% of all cases [11]. These metastases most often occur secondary to breast, lung, and prostate cancers. In rare cases, skull involvement is the first and only site of distant recurrence [4,11].

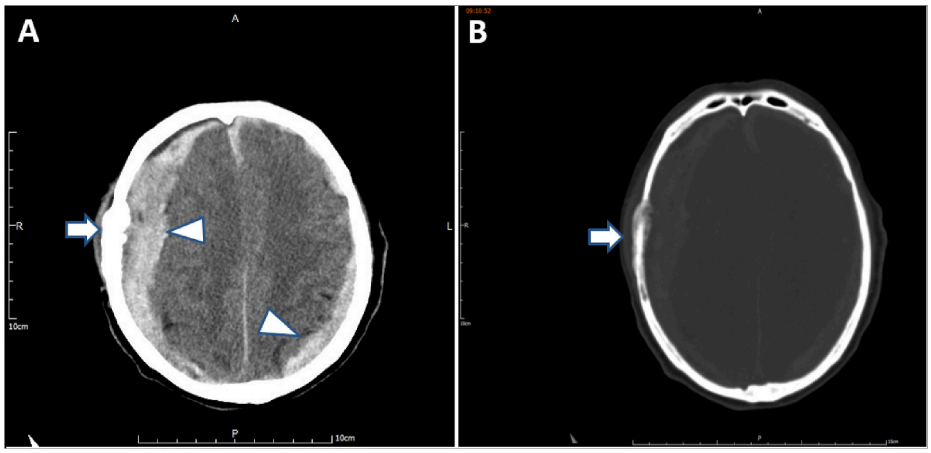

Fig. 1. Photographs of CT scan of brain (A) indicates an osteoblastic lesion over the right frontotemporal bone (arrow) with bilateral subdual hematomas compressing on the brain (arrowhead). Bone window depicts an osteoblastic mass over the frontotemporal bone (B, arrow).

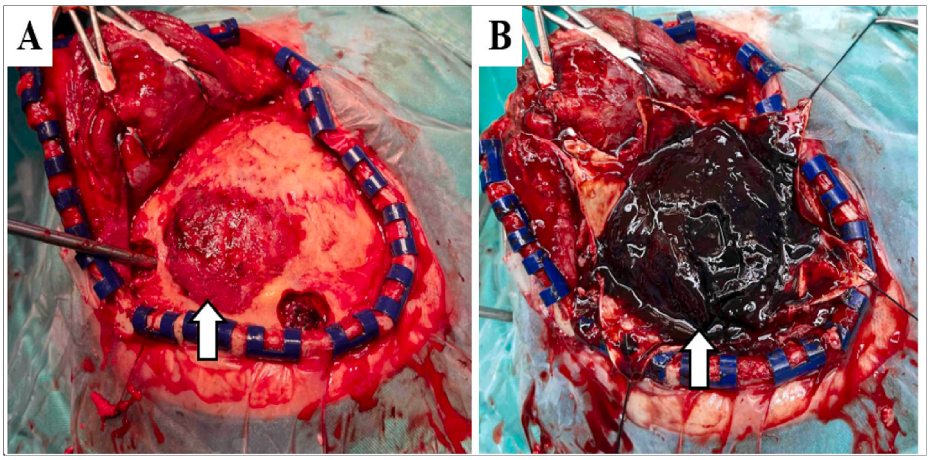

Fig. 2. Photographs of intraoperative findings show an osteoblastic mass with irregular surface over the right frontotemporal bone (A, arrow) and massive fresh-like bloody clots after craniectomy with removal of the bony fragment (B, arrow).

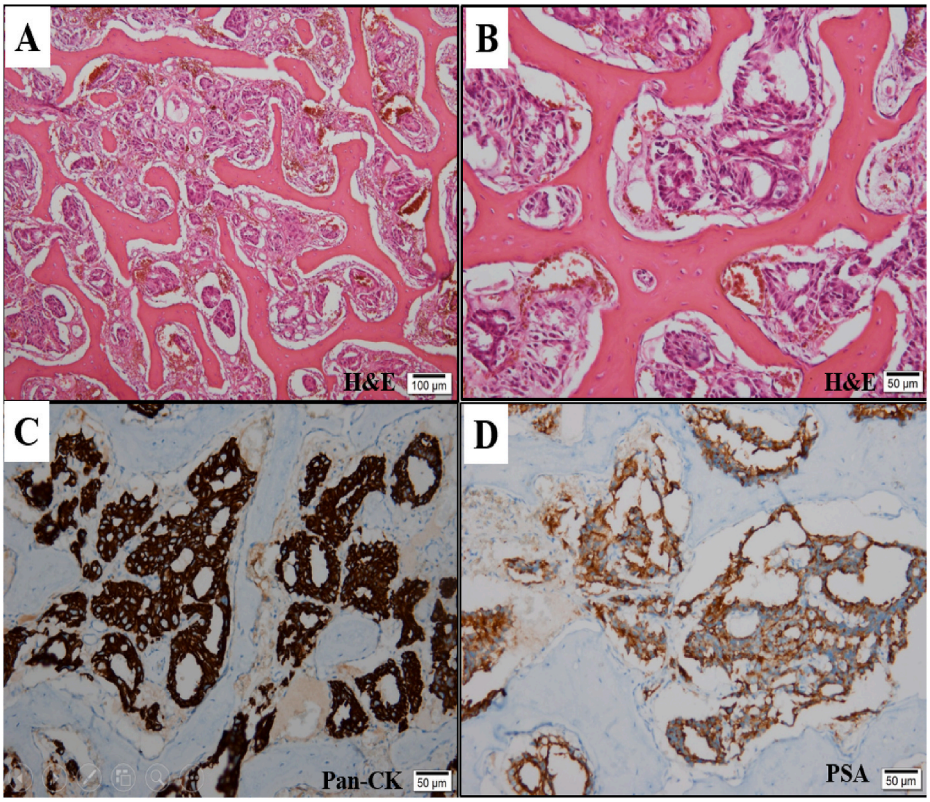

Fig. 3. Representative sections of the frontotemporal bone specimen with hematoxylin & eosin stain show moderately differentiated metastatic prostatic adenocarcinoma (A, H&E, original magnification ×100, B, H&E, original magnification ×200). The IHC analysis demonstrates strongly diffuse positive for pan-CK (A, IHC, original magnification ×200), and positive immunostaining for PSA (D, IHC, original magnification ×200).

Cranial neurological deficits or nerve palsies caused by prostatic cancer metastasis are uncommon in advanced disease but constitute important clinical characteristics. Skull metastasis can cause symptoms of nervous system debilitation, such as cranial nerve palsy, preferentially causing urological symptoms, facial nerve palsy, multiple cranial nerve palsies, otological symptoms, and ophthalmoplegia [2–4,14,17].

A review of the literature shows that cases of bony metastatic cancer occurring in the skull and temporal bones are relatively rare [1–3,5,8,9,11]. The frequency and primary tumor site of temporal bone metastasis were determined, and the related symptoms were characterized. Recent systematic reviews of distant temporal bone metastases and contemporary clinicopathological analysis indicated that the median age of men was 59.0 years (range: 2–90 years). The most common sites of primary malignant tumors included the breast (19.6%), lung (16.1%), and prostate (8.6%), which were predominantly adenocarcinomas in origin (49.4%). The most common sites of metastasis are the petrous bone (72.0%) and mastoid (49.0%) of the temporal bone, and patients with bilateral temporal bone metastasis accounted for 39.8% [5]. However, some cases have no obvious clinical symptoms, such as urological symptoms or cranial deficits, and the involvement of temporal mass has no specific clinical signs, such as atypical clinical symptoms in the present case. Therefore, it should be doubted whether the patient has

the possibility of developing occult prostate cancer at presentation.

To analyze the imaging findings of bone metastases in patients with D2 stage prostatic cancer before and after endocrine therapy, untreated lesions were divided into five types: osteoblastic (15%), mixed but mainly osteoblastic (31%), mixed but mainly osteolytic (17%), osteolytic (10%), and undetermined with a positive bone scan (27%) [18].

In our case, based on the family members' statements, the patient had no craniofacial or neurological symptoms in the past or recently, and only excessively high PSA levels could be detected. The patient's family refused prostatic tissue biopsy. We did not histologically confirm primary PCa because secondary metastasis had been identified. Owing to a high degree of suspicion based on old age, sex, PSA level, and radiological evidence of osteoblastic lesions on CT scans, metastatic lesions of the frontotemporal bone cannot be completely ruled out if there is a possibility of occult prostate cancer with distal or bony metastasis. Histopathological examination showed a moderate differentiated adenocarcinoma and IHC staining demonstrated strongly positive immunostaining for pan-CK and PSA of a surgical biopsy of the skull bone confirmed metastatic PCa. Isolated cranial metastases from PCas are rare and are usually associated with other bone metastases. According to our knowledge and a review of the literature, we report the case with an extremely rare manifestation of incidental finding of metastatic PCa of the right frontotemporal bone presenting as subdural hemorrhage with no otological or cranial neurological deficits.

Patients with prostatic cancer metastasis to the skull may have no neurological symptoms or signs even in advanced stages. Occasionally, it is considered to be a primary skull neoplasm; therefore, any skull deformity in people over 60 years of age should be highly suspected [11], as in our case. Because the appearance of symptomatic or occult metastases in the temporal bone can affect treatment and prognosis, clinicians must actively look for them [3]. Treatment is mainly palliative, usually involving external beam radiation therapy combined with corticosteroids. For histological diagnosis or palliative decompression of radiotherapy-resistant tumors with worsening neurological deficits, surgery should be considered. To achieve complete resection, the lesion should be extensively resected to remove the marginal bone tissue and any infiltrating dura mater or skin. The goal of surgery is to provide rapid relief of symptoms with reduced morbidity and maintain function [10].

The prognosis for skull base metastasis is poor, with a median survival of approximately one year. However, recent case series have suggested a median survival of approximately 30 months, most likely related to the availability of better treatments for metastatic disease [4]. In our case whether this case will be due to the atypical clinical symptom of subdural hemorrhage, patient's choice, and delay the treatment of metastatic prostatic cancer, it should be worthy of consideration by clinicians. In our case demonstrates the importance of clinical care in geriatric patients. Understanding these manifestations will help reduce any delay in diagnosis and lead to the effective provision of appropriate treatment. In this case, the communication between the doctor and the patient's family was complicated at the beginning, and the doctor's decision-making was difficult and challenging. Since the surgical methods and prognosis of chronic subdural hematoma and metastatic tumors are completely different, the differential diagnosis of these diseases is very important and challenging [15]. Early detection can improve medical care and extend life expectancy, and the appearance of new lesions is associated with a good prognosis [19,20]. Awareness of the possibility of occult PCa involving the temporal bones and the application of IHC examination will help make a correct diagnosis. The aim of this study was to review the diagnostic and therapeutic challenges associated with the management of these patients.

4. Conclusion

Isolated skull metastasis in prostatic cancer is extremely rare in elderly men, with no urinary or neurological symptoms, and should raise the suspicion of occult prostatic cancer. There must be a deliberate attempt to exclude skull metastasis in all patients with advanced prostatic cancer.

Ethical approval

Institutional Review Board Statement: This study was approved by the Institutional Review Board of the Tri-Service General Hospital (TSGH), National Defense Medical Center. The reference number for their IRB approval No. is TSGHIRB No. : A202105189.

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Author contribution

- Junn-Liang Chang: drafting manuscript review, corresponding author, data interpretation, evaluation, information acquisition and final approval;
- Kuang-Ting Liu: responsible for operating pathological tissue/specimen processing, information acquisition and final approval, concept and design, critical review and final approval.
- Yueh-Ching Chang: responsible for operating pathological tissue sections, special chemical staining and immunohistochemical staining, information acquisition, critical review, and final approval.

Consent

Death of patient. (The patient died two months after the operation and could not be traced.)

We have tried our best to contact the patient's close relatives, but only verbally agreed to write this report.

※ICF/IC Waiver is granted by IRB approval is TSGHIRB No. : A202105189.

Registration of research studies

This article is a case report; registration is not required. The datasets in this article are available in the repository, upon request, from the corresponding author.

Guarantor

Junn-Liang Chang.

Provenance and peer review

Not commissioned, externally peer reviewed.

Declaration of competing interest

None.

Declaration of competing interest

None.

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