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Case Report

Brain meningioma incidentally detected on a bone scan: A Case report☆

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ABSTRACT

Incidental meningioma is defined as a mass diagnosed radiologically on MRI and CT scans without histopathological confirmation. In occasional cases, meningiomas can be diagnosed incidentally by bone scintigraphy. This article presents an interesting case where a 44-year-old lady with known breast cancer was found to have a brain meningioma, incidentally, detected on a bone scan, which was initially suspected to be metastatic brain changes. The follow-up MRI and histopathological studies confirmed the diagnosis of meningioma.

Introduction

Bone scintigraphy (BS) is one of the most widely used nuclear scanning modalities for cancer staging and follow-up. This modality is highly sensitive but not very specific. Commonly, bone scans can show atypical extra-osseous uptake which may or may not be related to the primary disease being examined [1,2]. The cranial uptake of a radioisotope can be seen in entities other than meningiomas such as tumoral calcinosis, infarction, and calcified aneurysm. In some cases, a diagnosis can be very challenging, and correlation with other imaging modalities and clinical findings are required to reach a diagnosis.

Case report

A-44-year-old lady, a known case of breast cancer on chemotherapy had a bone scan performed as part of the routine follow-up. Tc-99m MDP 9 bone scan showed a patchy area of increased uptake overlying the right side of the skull localized to the right frontal and right fronto-parietal bone on SPECT (Figs. 1 and 2). The patient denied any history of headache, seizures, loss of consciousness, nausea, vomiting, fever, or weakness. The neurological examination was unremarkable with no definite neurological deficits noted. Due to the patient's status, metastasis was suspected, and an MRI scan was requested to confirm the findings. MR of the

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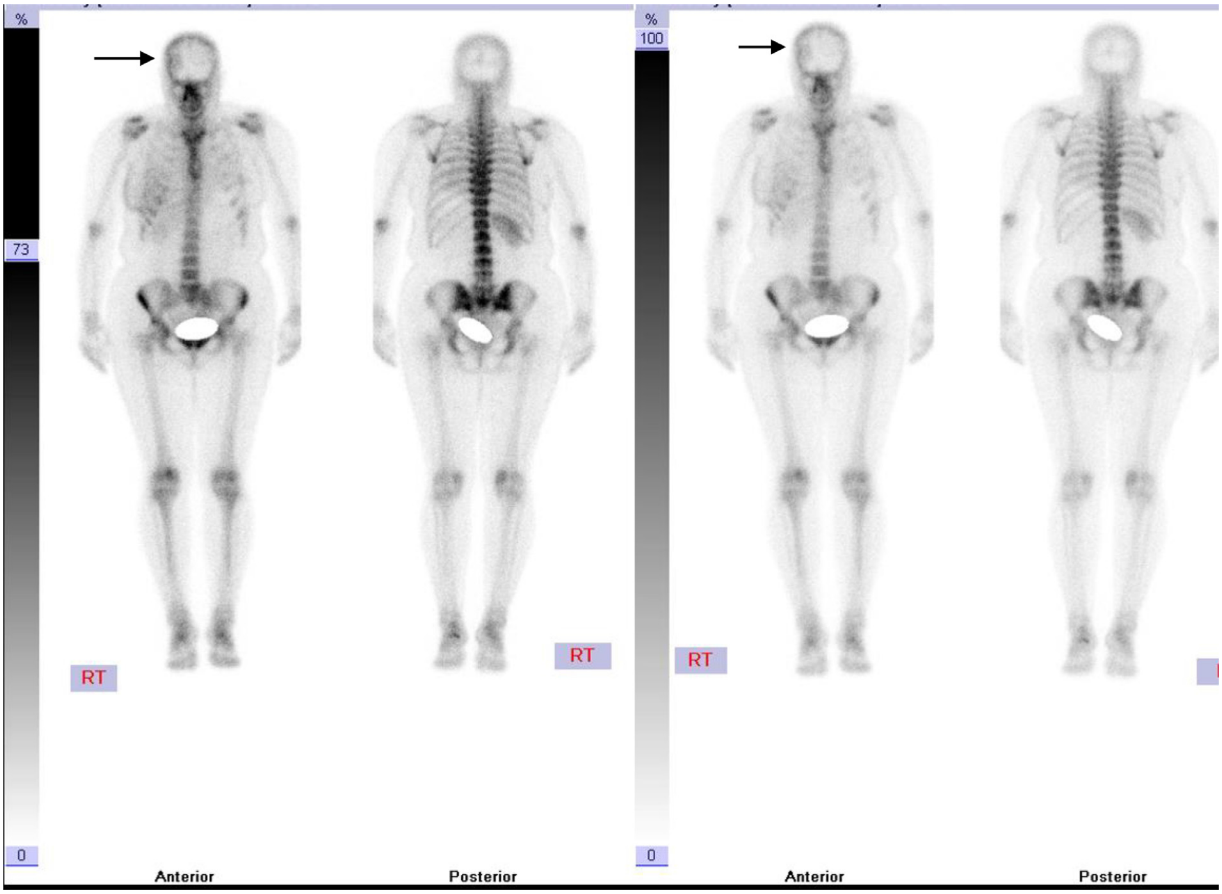

Fig. 1 – Whole body bone scan showing skull uptake (black arrow).

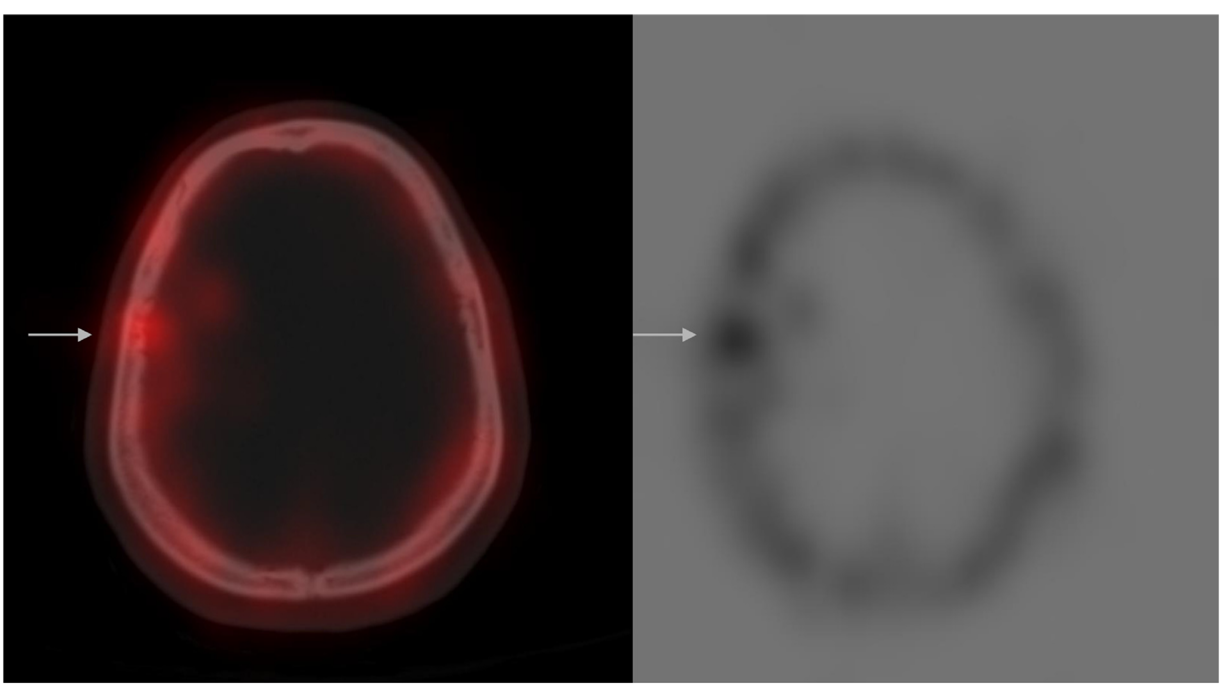

Fig. 2 – SPECT scan showing a focal uptake at the right fronto-parietal bone (white arrow).

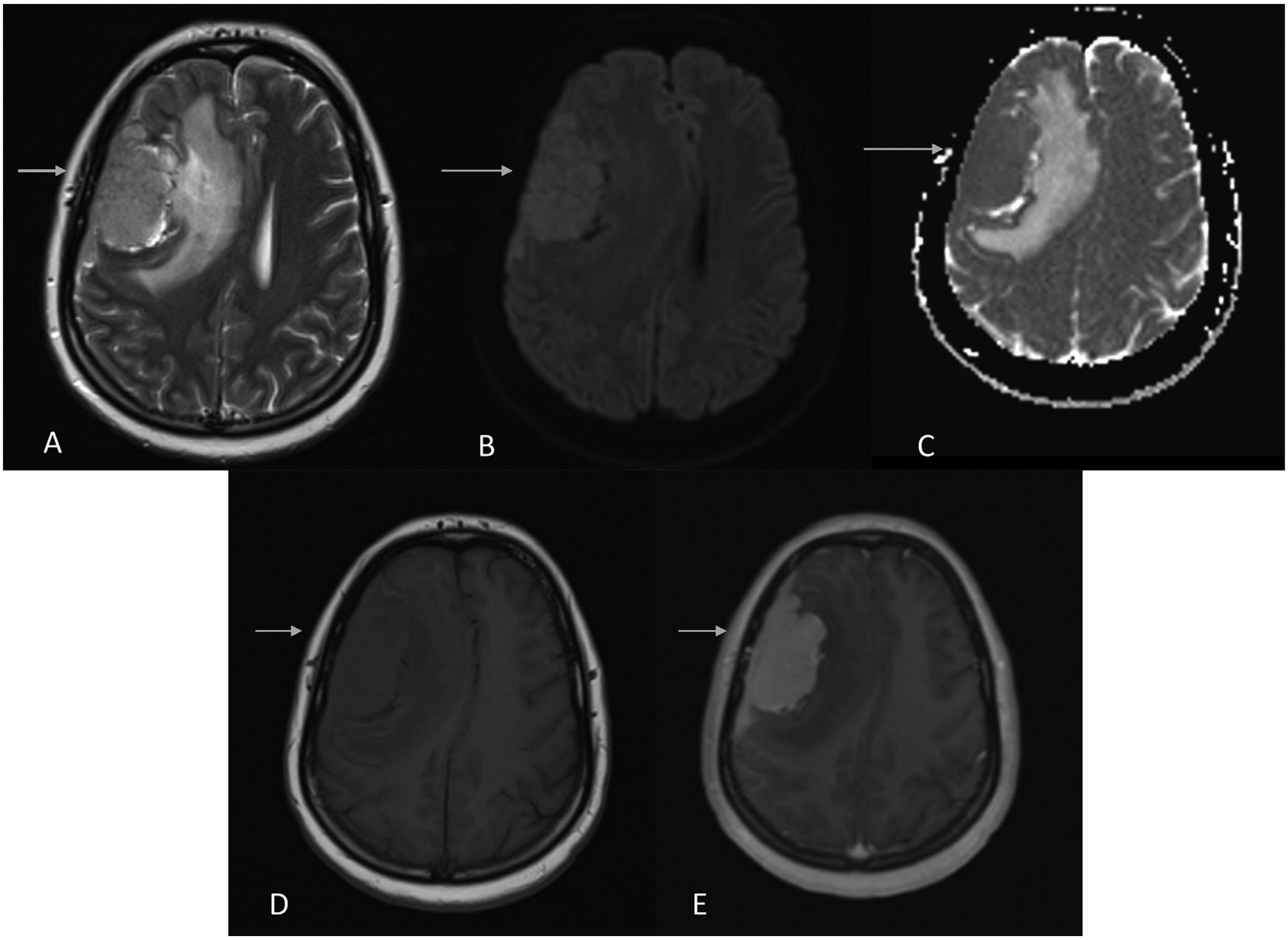

Fig. 3 – Multi-axial multisequential MRI brain showing A right frontal lesion with surrounding edema. The lesion appears iso-intense to the gray-matter in T1 (D) and T2 (A), with no diffusion restriction in DWI (B) and ADC (C) sequences with avid enhancement in T1 postcontrast (E).

brain demonstrated a well-defined extra-axial mass overlying the right frontal lobe. The mass enhanced avidly following the introduction of intravenous gadolinium (Fig. 3). The patient underwent a craniotomy and histopathology reports confirmed the diagnosis of an atypical meningioma (WHO grade 2) (Fig. 4). The patient is doing well and following up regularly with the oncology team.

Discussion

Meningioma is a common benign intracranial tumor and represents a third of all primary brain tumors [3]. Meningiomas are more common in the older population with a female predominance ratio of 2:1 [4]. The reported risk factors for meningioma include but are not limited to trauma, hormone replacement therapy, and breast cancer [5]. In many patients, a meningioma will not cause any symptoms or signs and is only diagnosed as incidental findings on imaging. Many genetic disorders are associated with an increased risk of meningioma formation, with NF2-Schwannomatosis considered the most common condition [6]. Meningiomas account for 15% of incidental findings on brain MRI with a prevalence of 5 per 1000 scans performed and the incidence rate increases as the age of patients increases [7]. According to recent studies of the surveillance, epidemiology, and End Results databases, almost 46%-55% of asymptomatic meningiomas were diagnosed incidentally based on radiological imaging without histopathological confirmation [8,9]. Although meningiomas are not particularly dangerous to patients, their commonality and ability to be silent (without signs and symptoms), make them an important entity for physicians to always keep in the back of their minds [10]. The common locations for meningiomas and the lack of specific noninvasive diagnostic tests make it important to be able to differentiate them from the myriad of potentially fatal differentials.

Radionuclide BS is an important imaging technique used to detect osteoblastic activity in local or systemic bone disorders. It is commonly used in cancer patients for staging and follow-up [1,2]. In other disorders, a bone scan may show nonosseous, soft-tissue lesions in the body due to focal bone-seeking radiotracer accumulation.

Clinical conditions with extra-osseous cranial uptake of bone-seeking radionuclides can be broadly classified into 2 major groups: those with calcification that may be demon-

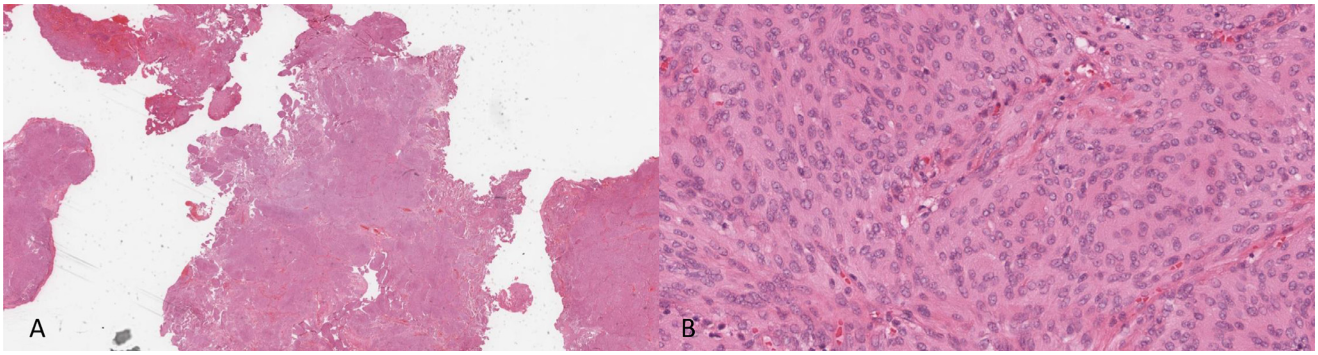

Fig. 4 – Low power (A) and high power (B) magnification microscope showing tumor neoplastic cells composed of lobules of syncytium-like appearance. The cells have clear nuclear holes, with occasional intranuclear pseudoinclusions.

strated histologically or radiologically; and those with acute tissue necrosis but without evidence of calcification. Calcified meningiomas and cerebral infarction are representative examples of these 2 major categories. In meningiomas, bone-seeking radionuclides are taken up in response to 3 known factors affecting calcium deposition, which are: tumor calcification, calvarial erosion, and reactive bone formation [11,12]. Lim et al. showed 2 different intensities in radiological and scintigraphical views between reactive hyperostosis and tumor calcification in their total cases of meningioma [13]. Shih et al reported a meningioma case with no calvarial erosion and reactive bone formation [14].

Wakisaka et al. reviewed BS in 4579 cases. Intracranial accumulations were demonstrated in 8 cases (0.178 %). The lesions with intracranial radionucleotide accumulations were consistent with 2 cases of primary brain tumor, five cases of metastatic brain tumor, and 1 case of cerebral infarction. Calcification was detected in 1 of 8 cases seen during the CT scans [15].

Most of the incidental meningiomas need follow-up without surgical intervention due to their slow growth pattern unless they produce symptoms or other changes affecting the patient's way of life.

It is important to pay attention to the cranial tracer accumulations during routine BS since brain tumors or infarctions may be confused with cranial bone metastasis [16]. Early detection and differentiation from other more worrying differentials help reduce patient anxiety, prevent unnecessary interventions, and decrease the use of hospital resources.

Conclusion

The need to recognize the pathophysiological causes of extraosseous uptake is of great clinical importance for patients undergoing BS. Radio-pharmaceutical preparation and changes in bio-distribution are important considerations to be addressed if extraosseous tracer uptake occurs, but accurate reporting requires sufficient knowledge of the pathophysiology behind the clinical condition and the modalities used when imaging. Detection and recognition will reduce errors and provide important clinical findings, creating an overall productive outcome for patients.

Patient consent

The patient gave her consent to use the radiological images and clinical information to be published as a case report. A written consent was obtained.

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