# BRIEF ARTICLES

## Dural-Based Metastatic Malignant Melanoma Masquerading as Meningiomata: A Diagnostic Challenge

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## ABSTRACT

Metastases from malignant melanomas can be difficult to diagnose, particularly when they are in uncommon locations. We report on an unsettling case of a 38-year-old woman who presented to neurosurgery with worsening neurological symptoms. Upon magnetic resonance imaging (MRI), the patient was found to have two sizeable dural-based lesions and underwent subsequent resection of the larger mass. Although the results of the pathohistological examination and immunohistochemistry staining were suspicious for metastatic malignant melanoma, an incorrect diagnosis of atypical meningioma was rendered due to the patient's age and lack of melanoma history. After the patient's condition continued to clinically deteriorate, dermatology was ultimately consulted and a more comprehensive work-up was carried out, revealing the correct and exceedingly rare diagnosis of dural-based metastatic melanoma of unknown primary. This case underscores the importance of a comprehensive diagnostic approach; one which employs careful histopathologic evaluation, judiciously selected immunohistochemical staining, and thorough physical examination.

## INTRODUCTION

Metastases from malignant melanomas (MM) to the dura mater are exceedingly rare and have been described in only a handful of reports, a majority of which are autopsy studies.[1] MM metastases to the central nervous system are more commonly represented by secondary lesions in the brain parenchyma or leptomeninges, rather than in the dura.[2] Meanwhile, metastatic lesions in the dura mater arise most commonly from carcinomas of the prostate, lungs, and breasts.[3] Unfortunately, these intracranial lesions can often times appear indistinguishable from meningiomas on imaging, leading to misdiagnoses and significant treatment delays. Because patients with metastatic disease require prompt oncological intervention, it is imperative for physicians to consider the possibility of metastases when evaluating dural masses. Regrettably, dural metastatic disease is one of the least studied patterns of neoplastic spread, underscoring the importance of an interdisciplinary diagnostic approach.[4]

## REPORT OF A CASE

We report on a 38-year-old woman who presented to neurosurgery with sudden left-sided deafness, facial droop and gait dysfunction. MRI revealed a large left petrotentorial mass (3.5 x 3.7 x 2.6 cm) with enhancement heterogeneity and a dural tail (Figure 1). An additional smaller dural mass, with similar radiographic features, was found adjacent to the right temporal lobe. The larger mass was resected and histopathological examination revealed cells with eosinophilic cytoplasm and intranuclear inclusions, as well as abundant tumor necrosis and increased mitotic activity. On immunohistochemistry, tumor cells were focally positive for Ki-67 and EMA, diffusely positive for Melan-A, HMB45, S100, and E-cadherin, weakly positive for SSRT2 and SOX-10, and negative for CK7. A diagnosis of atypical meningioma, oncocytic variant, was favored due to radiographic findings, poor tumor differentiation, patient age, and lack of melanoma history.

Several weeks later, the patient returned with worsening neurological symptoms. MRI revealed a dramatic interval increase in size of the second tumor with surrounding vasogenic edema. The patient subsequently underwent resection of this mass, and upon discovery of a malignant epithelioid tumor on frozen section, dermatology was consulted. Concurrently, mutation sequencing of the initial petrotentorial mass was revealed to be BRAF p.V600E positive.

On physical exam, multiple firm, painless subcutaneous nodules and tumors (≤ 8 cm) were appreciated, with no atypical nevi or cutaneous ulcerations noted. Punch biopsy revealed malignant epithelioid cells positive for SOX10 and pan melanoma (HMB-45, Melan-A, tyrosinase), while negative for H3K27me3 and CK7 (Figure 2). A positron-emission tomography scan uncovered numerous hypermetabolic subcutaneous lesions. Given the similar histology and immunophenotype expressed by the subcutaneous and dural tumors, a new diagnosis of dural-based metastatic melanoma of unknown primary was made. The patient was promptly started on treatment with dabrafenib and trametinib in combination with whole-brain radiation therapy.

**Figure 1. Parts A-B**
**Magnetic Resonance Imaging of the Brain**
**(A)** T2-weighted axial imaging shows a 3.5 x 3.7 x 2.6 cm enhancing extra-axial, multilobulated mass with dural tail, located in the left posterior fossa. **(B)** T1-weighted post-contrast coronal imaging shows the left petrotentorial mass causing mass effect on the brainstem, fourth ventricle, and left middle cerebellar peduncle.

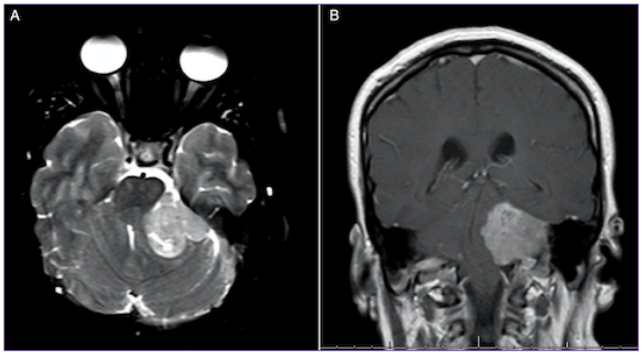
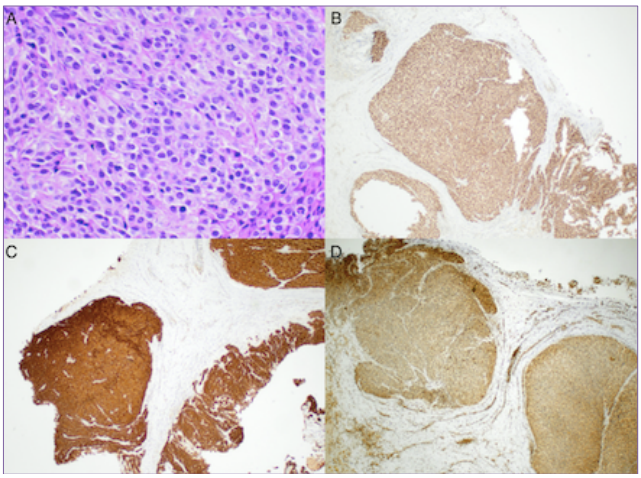



**Figure 2. Parts A-D**
**Punch Biopsy of Right Abdominal Nodule (4 mm wide x 1 mm in depth)**
**(A)** Staining with hematoxylin and eosin (H&E) shows pleomorphic epithelioid cells with vesicular nuclei and prominent eosinophilic nucleoli (original magnification x200). **(B)** Immunohistochemical stain (IHC) is positive for SOX-10, a marker for melanocytic cell differentiation (original magnification, x4).**(C)** IHC stain is positive for pan melanoma cocktail (HMB45, MART-1, Tyrosinase), supporting the diagnosis of metastatic melanoma (original magnification, x4). **(D)** IHC stain for H3K27me3 is retained, ruling out

malignant peripheral nerve sheath tumor (original magnification, x4).




## DISCUSSION

Despite both clinical and radiographic examination, dural-based lesions from metastatic carcinomas, such as MM, are particularly susceptible to misdiagnoses. While imaging studies are helpful in evaluating brain lesions, they can also be misleading; of note, the "dural-tail," a radiographic sign traditionally considered a characteristic feature of meningiomas, can also be seen in dural-based metastatic carcinomas.[1,3] Similarly, clinical evaluation and patient history may fail to provide evidence of a primary malignancy, as seen in this case. Thus, physicians should avoid diagnosing dural-based lesions as benign tumors solely based on clinical and radiographic judgment; a diagnosis of "meningioma" in this limited setting should be approached with clinical suspicion and pursuit of histopathologic differential diagnoses.

This case highlights that, while patient history, physical examination and radiographic imaging are important, judicious histopathologic evaluation combined with carefully selected immunohistochemical staining are essential to the accurate and timely diagnosis of dural-based metastatic malignant melanomas, as well as other dural-based lesions.

**Keywords:** malignant melanoma; dermatopathology; immunohistochemistry; metastatic melanoma; meningioma; dural-based metastatic carcinoma; intracranial lesions

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