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Case Report

# Metastatic Brain Melanoma: A Rare Case with Review of Literature

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## Abstract

Melanoma is a highly malignant neoplasm arising from melanocytes, which are melanin-producing neural crest cells primarily located in the basal layer of the epidermis, making cutaneous melanoma the most common subtype. However, melanocytes are also found in other anatomical locations, and primary non-cutaneous melanomas, though rare, have been documented. Due to the aggressive nature of this malignancy, it carries a poor prognosis, particularly because it tends to metastasize to various, often atypical, sites. Recognizing these variable presentations is essential for timely diagnosis. Here, we report a rare case of metastatic brain melanoma in a young female and review the relevant literature, highlighting the importance of imaging in identification.

**More Information**

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**Keywords:** Melanoma; Metastatic brain melanoma (MBM); Haemorrhage; Melanin; Melanotic melanoma; Sub-arachnoid haemorrhage



## Introduction

Melanoma—formerly termed malignant melanoma—is an aggressive neoplasm originating from melanocytes. Although it represents only 5% of all skin cancers, it accounts for approximately 75% of skin cancer-related deaths [1,2]. Cutaneous melanoma is the most common form due to the high concentration of melanocytes in the stratum basale. However, melanocytes are also found in the uveal tract, inner ear, vaginal epithelium, meninges, and bone, making rare cases of primary non-cutaneous melanoma possible.

Melanoma is notorious for its aggressive behaviour and high metastatic potential, often involving uncommon sites with varied clinical and radiological manifestations. The five-year survival rate for metastatic melanoma diagnosed between 2012 and 2018 was a dismal 30% [3,4], emphasizing the need for early detection and treatment. Brain metastasis from cutaneous melanoma is well-documented, ranking third among brain metastases [5], but often presents a diagnostic challenge due to its ability to mimic other pathologies.

Here, we present a rare case of intracranial metastatic melanoma in a 27-year-old female with previously undiagnosed cutaneous melanoma, illustrating the critical role of imaging in identifying such lesions.

## Case report

A 27-year-old female presented to the emergency department with a severe headache persisting for one month, acutely worsening over the past four days. The headache was dull and aching, alleviated by medication, and not associated with trauma or seizures. Neurological examination revealed no significant abnormalities.

A CT scan at an outside facility revealed a hyperdense extra-axial lesion in the left parieto-temporal region with surrounding parenchymal edema and mass effect. Hyper density was noted along the left Sylvian fissure, and a hyperdense focus in the occipital horn of the left lateral ventricle suggested haemorrhage. The case was initially misdiagnosed as subarachnoid haemorrhage with intraventricular extension from a presumed left middle cerebral artery aneurysm and referred to our center for further management.

Repeat CT angiography at our center confirmed a hyperdense lesion with hyperdensities along the Sylvian fissure and occipital horn (Figures 1 a,b). Post-contrast enhancement was noted, and a thin vessel from the left MCA was seen supplying the lesion (Figure 1c). DSA was negative for an aneurysm. Based on these findings, a provisional diagnosis of a hyperdense space-occupying lesion with secondary haemorrhage was made.

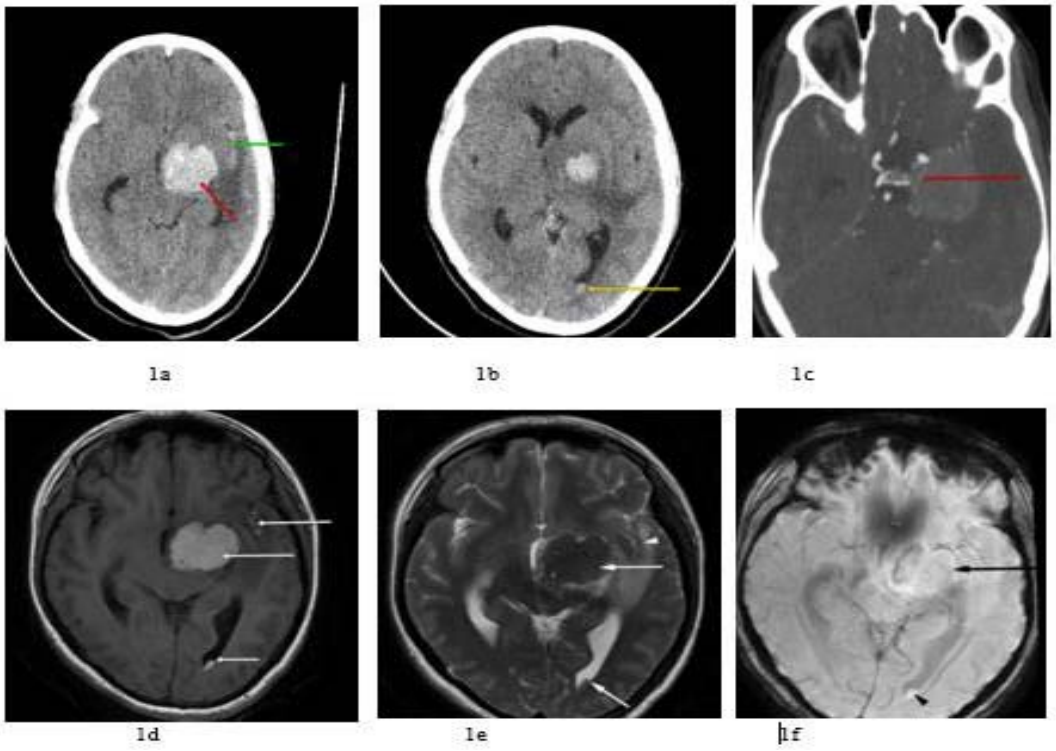


**Figure 1a-f:** Figure a: Axial NCCT showing an extra-axial hyperdense lesion (red arrow) and hyperdensity along the left sylvian fissure (Green arrow). Figure 1b: Intraventricular hyperdensity in occipital horn of left lateral ventricle (Yellow arrow).
Figure 1c: Axial CT Angiography image shows a thin feeder vessel (Red arrow) directly arising from Left MCA, traversing along and directly supplying the lesion. Figure 1d: Axial T1 weighted image shows hyperintense lesions (White arrows). Figure 1e: T2 weighted axial images show hypointense lesions (White arrows) and along sylvian fissure (Arrow head). Figure 1f: SWAN sequence shows no blooming in the extra axial lesion (Black arrow) and along the lesion in occipital horn (Black arrow head).

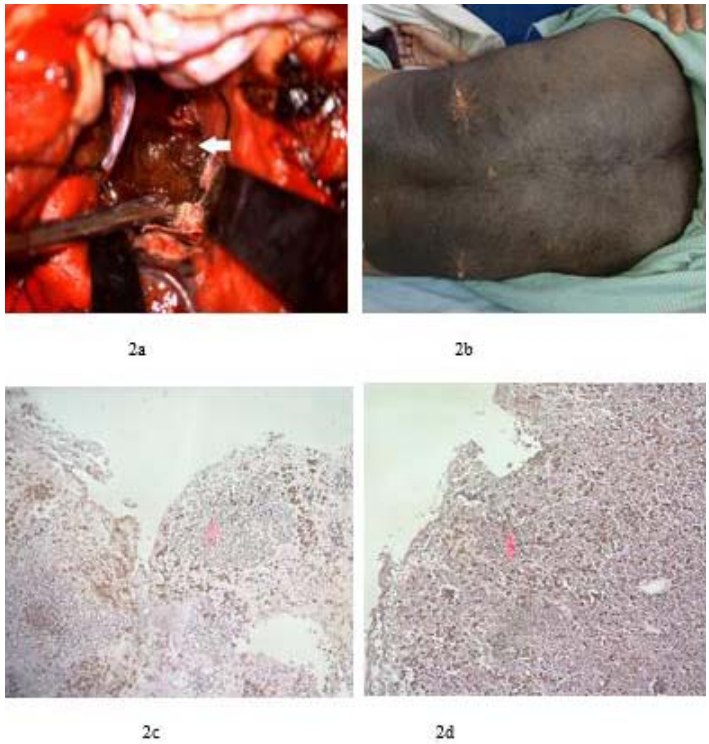


**Figure 2a-d:** a: Hyper melanotic intraoperative lesion. Figure 2b: Melanotic patch on the back. Figure 2c&d: Tumor cells spindle and ovoid in shape with increased nuclear cytoplasmic ratio and dense melanin accumulation-characteristic for melanoma.

Follow-up MRI revealed a heterogeneous lesion, hypointense on T2 and homogeneously hyperintense on T1 (Figures 1d, e), with no restriction on DWI and no blooming on GRE (Figures 1f, Figure 2a). The lesion caused midline shift and mass effect on the ipsilateral optic chiasm, parietal, and mesial temporal lobes. A black melanotic patch was noted on the patient's back during hospitalization (Figure 2b). Based on this finding and imaging review, metastatic brain melanoma was suspected.

Surgical excision was performed via a left pterional approach, revealing a greyish-black soft tissue lesion (Figure 2c), with smaller soft tissue deposits along the Sylvian fissure. Histopathology revealed spindle to ovoid tumor cells with a high N:C ratio and dense melanin accumulation, confirming melanoma (Figure 2d). Post-operative PET-CT revealed no other metastatic lesions.

## Discussion

Melanoma brain metastases (MBMs) from cutaneous melanoma are relatively common and associated with poor prognosis. Melanoma ranks third after lung and breast cancers in causing brain metastases [6]. MBMs are frequently associated with haemorrhage and have a high mortality rate [7,8].

Isiklar, et al. reported that MBMs are hyperintense on T1 and hypointense on T2 due to melanin content [9], as seen in our case. CT has utility in detecting hemorrhagic melanotic lesions due to hyperdensity from melanin or blood products [10]. Although Schellinger, et al. noted that brain metastases often localize at the grey-white matter junction [11], our case demonstrated atypical involvement of CSF spaces and intraventricular locations.

The presentation in our case differs from most MBM cases, where diagnosis follows a known cutaneous primary. In our patient, neurological symptoms were the first manifestation, with cutaneous melanoma only identified retrospectively. Reddy, et al. described a similar hemorrhagic presentation [12], but in our case, the absence of susceptibility on SWI sequences indicated that hyperdensity was primarily due to melanin. These imaging features, alongside an extra-axial lesion and intraventricular extension, made the diagnosis challenging and confusing until the discovery of the melanotic patch. While prior literature documents various imaging features of MBM, including T1 hyperintensity and hemorrhagic presentation, few cases describe it as the initial manifestation of melanoma. For example, a case by Reddy, et al. [12] reported hemorrhagic metastases as the first sign of melanoma, though without the intraventricular involvement seen in our patient. Similarly, a retrospective review by Glitza Oliva, et al. [13] included cases where brain metastases led to melanoma diagnosis, but our patient's solitary lesion, its mimicry of subarachnoid haemorrhage, and absence of blooming on SWI distinguish this case further.

MBMs are typically supratentorial, with a predilection for the parietal lobes due to vascular supply and tissue volume [11]. While hemorrhagic potential is well-documented [14,15], MRI, particularly susceptibility-weighted imaging (SWI), was crucial in distinguishing melanin from haemorrhage in this case.

Despite treatment advances, MBM prognosis remains poor, with median overall survival ranging from 5.3 to 7.2 months depending on molecular profile and treatment strategy. Recent studies indicate that immune checkpoint inhibitors and targeted therapies, particularly those targeting BRAF mutations or combining anti-PD-1 and anti-CTLA-4 agents, have significantly improved survival in select subgroups of patients [13,16]. For instance, a 2021 real-world cohort study demonstrated a median survival of over 7 months in patients treated with combination immunotherapy [13]. However, prognosis remains guarded, especially in patients with multiple lesions or extracranial metastasis [16]. Surgery plays a palliative role, relieving symptoms and improving quality of life by reducing mass effect and neurological deficits.

Compared to other reports [17,18], our case stands out due to the patient's age, extra-axial lesion, intraventricular component, and initial misdiagnosis. These findings highlight the importance of clinical vigilance and comprehensive radiologic and physical evaluation in atypical neurological presentations and whenever a patient presents with a hyperdense extra-axial mass on CT (Tables 1 and 2).

**Table 1:** Imaging Features of Melanotic vs. Amelanotic Metastatic Brain Melanoma (MBM).

| Feature | Melanotic MBM | Amelanotic MBM |
|---|---|---|
| T1 MRI | Hyperintense | Iso-/hypointense |
| T2 MRI | Hypointense | Hyperintense |
| CT Appearance | Hyperdense | Variable |
| SWI Blooming | Absent | May be present |
| Contrast Enhancement | Homogeneous | Heterogeneous |

**Table 2:** Differential Diagnosis for Hyperdense Extra-axial Lesions on CT.

| Condition | CT Appearance | MRI Features | Key Differentiators |
|---|---|---|---|
| Melanotic MBM | Hyperdense | T1 hyperintense, T2 hypointense | Melanin content, no SWI blooming |
| Haemorrhagic metastasis | Hyperdense | T1 hyperintense, SWI blooming | History of malignancy, peripheral location |
| Subarachnoid hemorrhage (SAH) | Hyperdensity in cisterns | FLAIR hyperintensity in sulci | Traumatic history or aneurysm |
| Epidermoid cyst | Slight hyperdensity | T1 iso-/hypointense, DWI restriction | No enhancement, diffusion restriction |

## Conclusion

Our case demonstrates the occult nature of MBM and how the lesions can masquerade as hemorrhages, particularly on CT, and as intracranial space-occupying lesions of unknown origin on MRI. In such cases, a high index of suspicion for MBM should be maintained, with simultaneous evaluation for occult primary cutaneous melanoma or melanoma from other systemic sites.

Patient consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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