



## Case Report

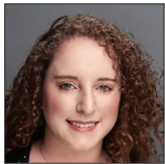
# Melanoma brain metastasis mimicking cortical laminar necrosis

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Received : 25 March 2022

Accepted : 24 June 2022

Published : 23 December 2022

### DOI

10.25259/SNI\_285\_2022

### Quick Response Code:



## ABSTRACT

**Background:** Metastatic lesions to the brain are common in patients with melanoma. Imaging characteristics can support the diagnosis of metastatic melanoma, but alternative diagnoses should be considered.

**Case Description:** Here, we present a case of a 57-year-old man in whom a metastatic melanoma initially mimicked the imaging characteristics of cortical laminar necrosis.

**Conclusion:** This comprises the first report of melanoma brain metastasis presenting with these imaging characteristics and emphasizes the importance of maintaining a high index of suspicion for metastatic lesions in patients with known cancer.

**Keywords:** Brain metastasis, Melanoma, Magnetic resonance imaging

## INTRODUCTION

Brain metastases are the most common adult intracranial malignancy. Because of the relatively high incidence of brain metastases in patients with advanced metastatic melanoma, the recommendation is for contrast-enhanced brain magnetic resonance imaging (MRI) screening and surveillance.<sup>[7]</sup> This frequently leads to diagnosis of brain metastases in asymptomatic patients but also results in the identification of incidental nonmetastatic pathology. A solitary brain lesion in the setting of a known primary cancer cannot be presumed to be cancer, as 11% of isolated lesions yield an alternate pathology.<sup>[5]</sup> In the case of melanoma brain metastases, imaging characteristics can provide clues to its diagnosis; metastatic lesions in the brain generally appear on MRI as spheroid contrast-enhancing lesions at the gray-white junction with robust surrounding edema. Contrast-enhanced T1-weighted images are the most sensitive sequence due to early breakdown of the blood-brain barrier.<sup>[2]</sup> Perilesional hemorrhage is present 40% of patients with melanoma metastases.<sup>[8]</sup> Lesions also can demonstrate hyperintensity on T1-weighted imaging and hypointensity on T2-weighted imaging due to associated melanin or perilesional hemorrhage, but the specificity of these findings is not well known.<sup>[4]</sup>

Here, we present the case of a patient with diagnosis of metastatic melanoma without neurologic symptoms, with surveillance MRI revealing the typical appearance of cortical laminar necrosis.

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On follow-up MRI, the lesion grew with features suggestive of metastasis that was confirmed on pathology examination. This case emphasizes the necessity of a high index of suspicion for the presence of metastatic disease despite unusual imaging appearance and the need for short-term surveillance when any clinical or radiographic ambiguity or discordance exists.

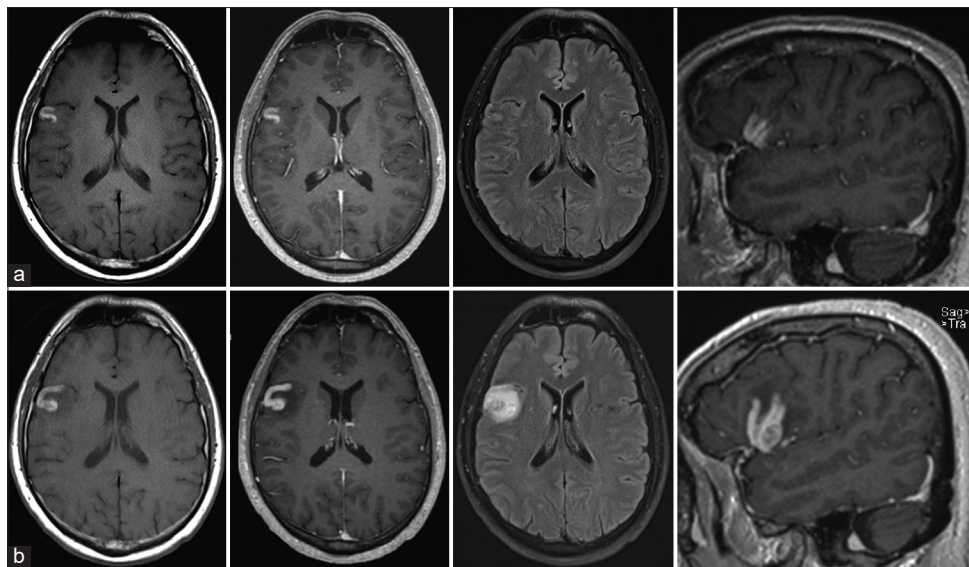
## CASE REPORT

A 57-year-old man was referred to neuro-oncology for brain MRI findings concerning for cortical laminar necrosis in the setting of metastatic melanoma. He was originally diagnosed with Stage IIIB (pT4bN1aM0) *BRAF* V600E-mutated cutaneous melanoma 6 years before evaluation with positive sentinel lymph node biopsy. Brain MRI at that time was normal. He had received multiple treatments throughout the years but for the past 30 months had been treated only with encorafenib and binimetinib with stable systemic disease. His medical history was otherwise unremarkable and he had no risk factors for vascular disease.

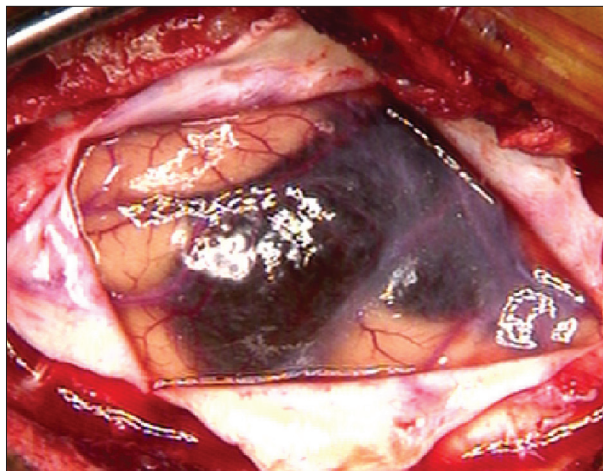
Routine, asymptomatic surveillance brain MRI with contrast was obtained and was notable for gyriform T1 shortening in the right pars opercularis, new from most recent imaging performed 23 months prior [Figure 1a]. Contrast-enhanced

T1-weighted imaging showed no discernable enhancement, T2-weighted sequences showed no local edema, and diffusion-weighted imaging showed no diffusion restriction. These findings were most consistent with cortical laminar necrosis from chronic infarction. Nonetheless, given his clinical history and lack of vascular risk factors, metastatic disease remained a diagnostic consideration and close interval follow-up was planned.

Repeat MRI obtained 3 months later revealed gyriform expansion in the region of the T1 shortening as well as a new contrast-enhancing adjacent nodule with vasogenic edema [Figure 1b]. Given imaging features, he underwent craniotomy revealing a subpial lesion that was grossly melanotic. The lesion followed and infiltrated gray matter in a gyriform pattern, with an adjacent melanotic nodule [Figure 2]. A total resection was achieved utilizing subpial dissection to protect nearby Sylvian vessels. The surgical specimen showed cortical gray matter with infiltration by neoplastic cells in a primarily perivascular pattern with no definitive tumor mass. The neoplasm was composed of large cells with atypical nuclei and prominent nucleoli. The majority of the tumor cells showed melanin pigment. All these findings were consistent with a metastatic malignant melanoma. The tumor expressed the mutant *BRAF* V600E protein by immunohistochemistry. The patient recovered well without postoperative neurological deficit. He received



**Figure 1:** Preoperative progression of MRI characteristics. (a) Axial T1 noncontrast, T1 contrast, FLAIR, and sagittal T1 contrast MRI images demonstrate gyriform gray matter T1 shortening without contrast enhancement or adjacent edema. No diffusion restriction was present on diffusion-weighted sequences (not shown). (b) Axial T1 noncontrast, T1 contrast, FLAIR, and sagittal T1 contrast MRI images demonstrate interval gyriform expansion adjacent to the previously noted T1 shortening, development of surrounding vasogenic edema, and new contrast-enhancing nodule apparent on T1 sagittal postcontrast image.



**Figure 2:** Intraoperative photograph. Dural leaflets are reflected to reveal a brown-colored melanotic lesion.

Gamma Knife radiosurgery to the surgical bed with a dose of 9 Gy at the 50% isodose line.

## DISCUSSION

We present an unusual case of metastatic melanoma to the brain with MRI imaging characteristics that suggested cortical laminar necrosis consistent with a chronic cortical infarction. The recognition of melanoma brain metastases is important for patient prognostication and treatment. The number of brain metastases is an independent prognostic indicator in melanoma, along with the presence of extracranial metastases, Karnofsky performance score, age, and *BRAF* status.<sup>[6]</sup> Moreover, while leptomeningeal spread of melanoma is well described,<sup>[3]</sup> subpial metastasis occurring in a gyriform pattern is not.

Brain cortical laminar necrosis was the initial diagnostic consideration in this case. This typically occurs following a hypoxic-ischemic event, in which the ischemia is not severe enough to affect less metabolically active white.<sup>[1]</sup> Cortical ischemia demonstrates diffusion restriction within several hours after an initial insult; this diffusion restriction fades over several weeks. T1 shortening may appear 2 weeks after the precipitating event. Cortical T1 shortening can both precede and outlast gyriform contrast enhancement if it occurs.<sup>[1]</sup> The pattern of gyriform T1 shortening with the absence of diffusion restriction in this case is compatible with chronic cortical laminar necrosis. However, T1 shortening can also occur with hemoglobin degradation products, lipids, calcifications, proteinaceous substances, and melanin.<sup>[9]</sup> In the case of melanin or heme deposition due to metastatic melanoma, this generally occurs in a more typical appearing spheroid lesion at the gray-white matter with perilesional vasogenic edema. Given

the clinical-radiographic discordance encountered in this patient, short-term follow-up MR imaging (and subsequently surgery) was pursued to help delineate the underlying etiology of the lesion. To the best of our knowledge, this is the first report of metastatic melanoma presenting with isolated T1 shortening in a gyriform pattern of involvement and mimicking a chronic cortical laminar necrosis pattern. This case illustrates the need for close-interval repeat imaging and consideration of biopsy in patients with an oncologic history.

## CONCLUSION

The case presented here illustrates a metastatic melanoma that initially mimicked the appearance of cortical laminar necrosis. This emphasizes the role of close surveillance in patients with known primary cancers and unusual imaging findings.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Cannella R, Sparacia G, Re VL, Oddo E, Mamone G, Miraglia R. Advanced magnetic resonance imaging of cortical laminar necrosis in patients with stroke. *Neuroradiol J* 2019;32:431-7.
2. Deike-Hofmann K, Thunemann D, Breckwoldt MO, Schwarz D, Radbruch A, Enk A, *et al.* Sensitivity of different MRI sequences in the early detection of melanoma brain metastases. *PLoS One* 2018;13:e0193946.
3. Glitza IC, Smalley KS, Brastianos PK, Davies MA, McCutcheon I, Liu JK, *et al.* Leptomeningeal disease in melanoma patients: An update to treatment, challenges, and future directions. *Pigment Cell Melanoma Res* 2020;33:527-41.
4. Gramsch C, Goricke SL, Behrens F, Zimmer L, Schadendorf D, Krasny A, *et al.* Isolated cerebral susceptibility artefacts in patients with malignant melanoma: metastasis or not? *Eur Radiol* 2013;23:2622-7.
5. Patchell RA, Tibbs PA, Walsh JW, Dempsey RJ, Maruyama Y, Kryscio RJ, *et al.* A randomized trial of surgery in the treatment of single metastases to the brain. *N Engl J Med* 1990;322:494-500.
6. Sperduto PW, Jiang W, Brown PD, Braunstein S, Sneed P, Wattson DA, *et al.* Estimating survival in melanoma patients with brain metastases: An update of the graded

- prognostic assessment for melanoma using molecular markers (melanoma-molGPA). *Int J Radiat Oncol Biol Phys* 2017;99:812-6.
7. Swetter SM, Thompson JA, Albertini MR, Barker CA, Baumgartner J, Boland G, *et al.* NCCN guidelines(R) insights: Melanoma: Cutaneous, version 2.2021. *J Natl Compr Canc Netw* 2021;19:364-76.
  8. Wronski M, Arbit E. Surgical treatment of brain metastases from melanoma: A retrospective study of 91 patients. *J Neurosurg* 2000;93:9-18.
  9. Zimny A, Zinska L, Bladowska J, Neska-Matuszewska M, Sasiadek M. Intracranial lesions with high signal intensity on T1-weighted MR images review of pathologies. *Pol J Radiol* 2013;78:36-46.

**How to cite this article:** Marino AC, Fadul CE, Lopes MB, Patel SH, Asthagiri AR. Melanoma brain metastasis mimicking cortical laminar necrosis. *Surg Neurol Int* 2022;13:584.

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