When MRI Can't Decide: SSTR PET/CT in a Treated Sphenoid Wing Meningioma

Cu-64 DOTATATE PET/CT to separate recurrent tumor from treatment effect

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Clinical Presentation

Woman in her 70s with WHO grade I meningioma of the left sphenoid wing and orbit

2019
Subtotal resection

2022
Local progression; IMRT, 50.4 Gy in 28 fractions

2024
Recurrence on MRI at age 76; tumor board review

2025
Growth despite everolimus and octreotide

2026
Cu-64 DOTATATE PET/CT

Re-irradiation: not safe

Left optic nerve already received at least 50 Gy, so a definitive second course carried a high risk of blindness

Repeat surgery: not advised

Neurosurgery recommended against re-resection. No tumor-related visual deficits; headaches of uncertain relation

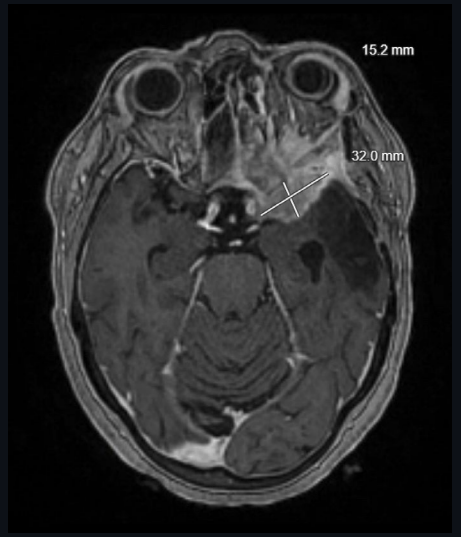
Imaging: Post-Treatment MRI



A. 2022: T1, no contrast



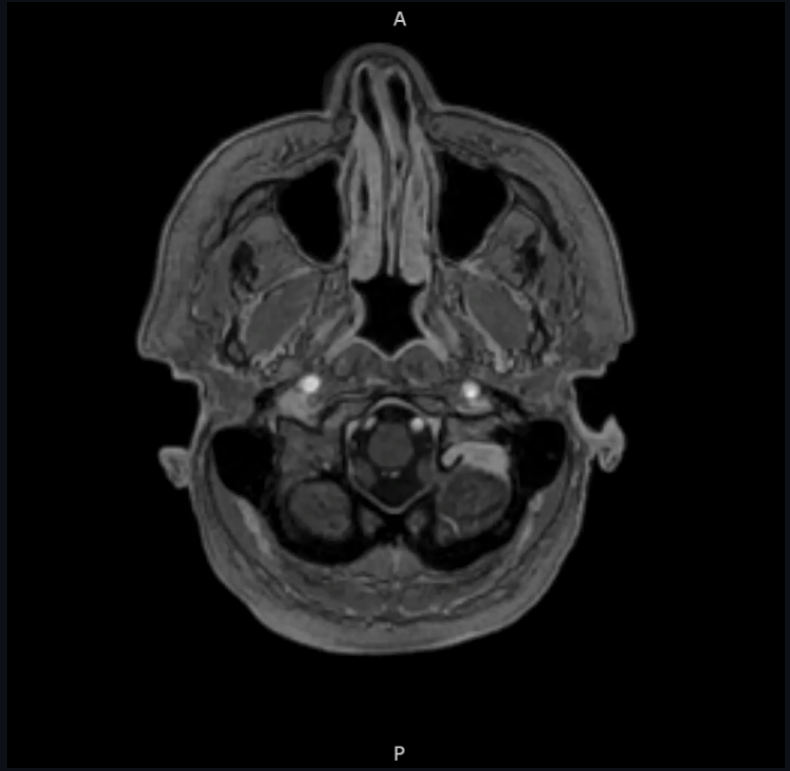
B. 2023, +C: 28 x 14 mm



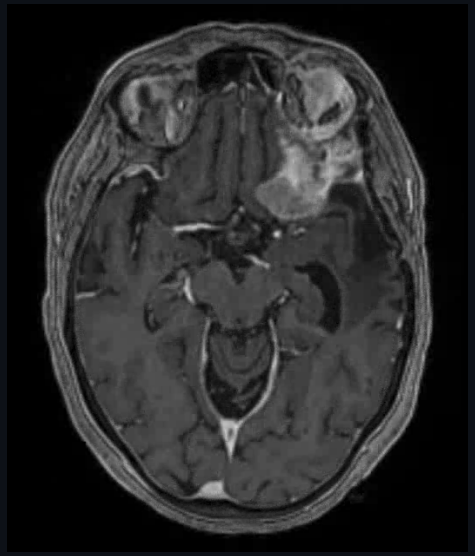
C. 2024, +C: 32 x 15 mm

Axial T1 (B, C: 3D MP-RAGE post-contrast). Slow change in a bed distorted by fibrosis, encephalomalacia, and dural thickening: recurrent tumor or treatment effect?

2024



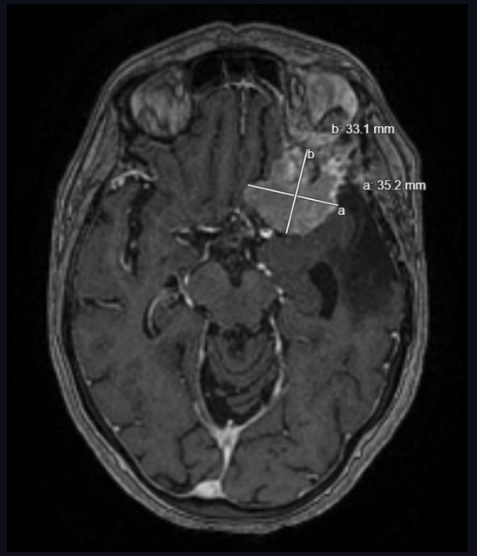
Imaging: Growth Despite Systemic Therapy



A. 2024



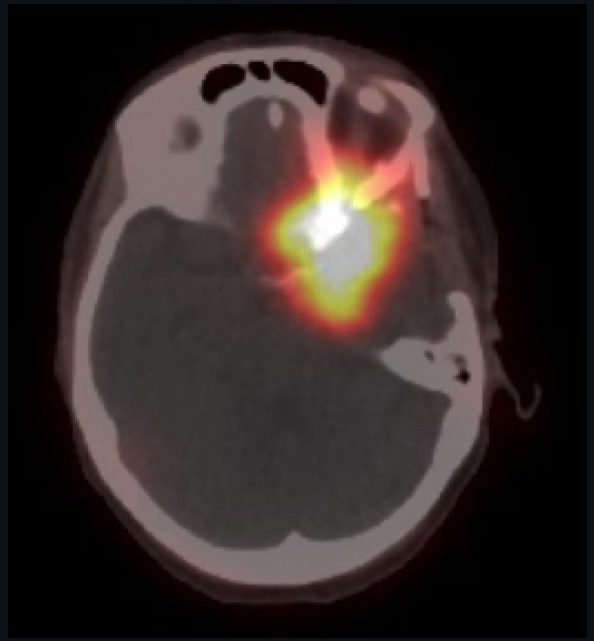
B. 2025: 29 x 28 mm



C. 2026: 33 x 35 mm

Enhancing tissue enlarged on everolimus and octreotide. Is it SSTR-positive, and how far does it extend?

Imaging: Cu-64 DOTATATE PET/CT



A. Axial fused PET/CT

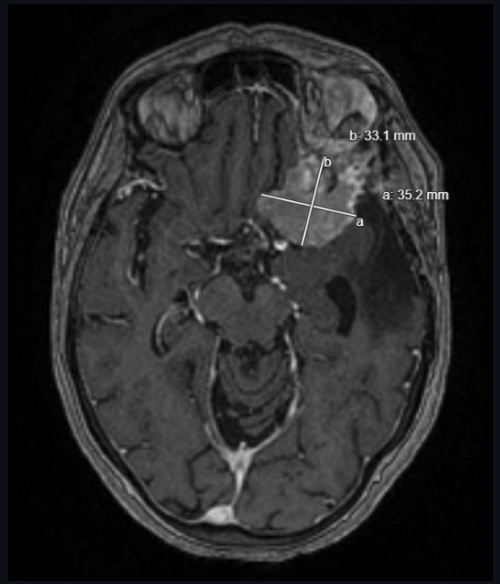


B. Whole-body MIP

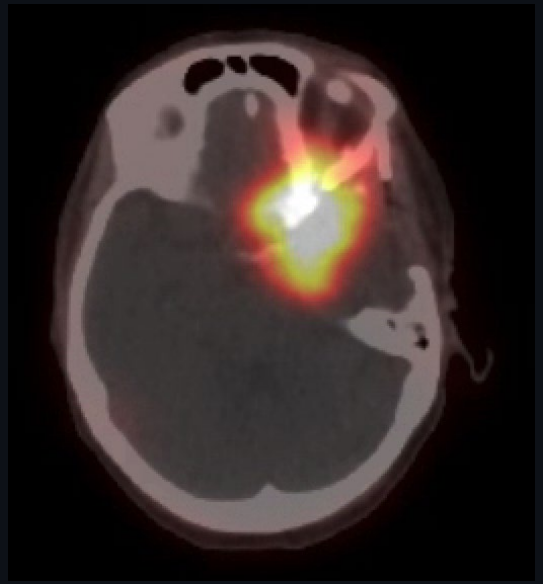
13 SUVmax

- Intense, well-localized uptake in the region of equivocal MRI signal
- Extends into the left middle cranial fossa, posterior paranasal sinuses, and left orbit
- No abnormal uptake elsewhere in the body

Imaging: MRI and PET Side by Side



A. MRI 2026: enlarging enhancing tissue



B. PET/CT 2026: intense SSTR uptake

The enhancing tissue on MRI corresponds to intense SSTR uptake.

Why SSTR PET Works in Meningioma

- Meningiomas frequently overexpress somatostatin receptor subtype 2 [1]
- DOTATATE uptake correlates with SSTR2 expression on histology [2]
- SSTR PET adds information beyond MRI or CT alone [3]

2.3 — SUVmax threshold separating tumor from tumor-free tissue [2]

90% vs 79% — Sensitivity for tumor tissue, PET vs MRI [2]

13 — SUVmax in this patient

Management and Outcome

Management

- Prior everolimus and octreotide: continued growth
- PET confirmed active, SSTR-positive tumor and prompted discussion of PRRT
- PRRT is investigational in meningioma; pooled disease control 63% in 111 refractory patients [3,4]

Outcome

- Diagnostic uncertainty resolved
- Localized recurrence or progression, no distant disease
- Extent of disease and therapy eligibility clarified
- No follow-up imaging or clinical outcome yet

Take Home Points

- Post-surgical and post-radiation change (fibrosis, encephalomalacia, dural thickening) can closely mimic recurrent meningioma on MRI
- Meningiomas overexpress SSTR2, so Cu-64 or Ga-68 DOTATATE PET/CT can separate tumor from treatment effect when MRI is equivocal
- When surgery and radiation are exhausted, SSTR-avid disease supports evaluation for SSTR-targeted therapy, including PRRT

References

1. Schulz S, Pauli SU, Schulz S, et al. Immunohistochemical determination of five somatostatin receptors in meningioma reveals frequent overexpression of somatostatin receptor subtype sst2A. Clin Cancer Res. 2000;6(5):1865-1874.
2. Rachinger W, Stoecklein VM, Terpolilli NA, et al. Increased 68Ga-DOTATATE uptake in PET imaging discriminates meningioma and tumor-free tissue. J Nucl Med. 2015;56(3):347-353.
3. Albert NL, Preusser M, Traub-Weidinger T, et al. Joint EANM/EANO/RANO/SNMMI practice guideline/procedure standards for diagnostics and therapy (theranostics) of meningiomas using radiolabeled somatostatin receptor ligands: version 1.0. Eur J Nucl Med Mol Imaging. 2024;51(12):3662-3679.
4. Mirian C, Duun-Henriksen AK, Maier A, et al. Somatostatin receptor-targeted radiopeptide therapy in treatment-refractory meningioma: individual patient data meta-analysis. J Nucl Med. 2021;62:507-513.