From Primary to Pituitary: Skull Base Tumor-to-Tumor Metastasis Insights and Systematic Review

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Background

- Tumor-to-tumor metastasis within Pituitary Neuroendocrine Tumors (PitNETs) is an exceptionally rare occurrence, posing significant diagnostic and therapeutic challenges.
- This study aims to enhance the understanding of this phenomenon through a systematic literature review and the presentation of two illustrative case reports.

Methods and Materials

- A systematic review was conducted using PubMed and Google Scholar according to PRISMA guidelines, including 38 cases of PitNETs harboring metastasis, with data extraction on demographics, clinical presentation, and treatment outcomes.
- Additionally, we present two cases from our institution: one involving metastasis from renal cell carcinoma and another from prostate adenocarcinoma.
- Data analysis included descriptive statistics and Kaplan-Meier survival analysis to evaluate the impact of different surgical approaches on patient outcomes.

Case 1

- **Patient:** 56-year-old male with progressive visual decline to blindness; history of renal cell carcinoma treated with nephrectomy.
- **Findings:** MRI showed a large (43.3 × 64.1 × 40 mm) sellar/suprasellar mass with hemorrhage, optic chiasm compression, and cavernous sinus invasion.
- **Surgery:** Endoscopic endonasal approach achieved subtotal resection; histopathology confirmed renal cell carcinoma metastasis within a gonadotroph PitNET.
- **Post-op:** No visual improvement; received stereotactic radiation therapy (2500 cGy in 5 fractions).

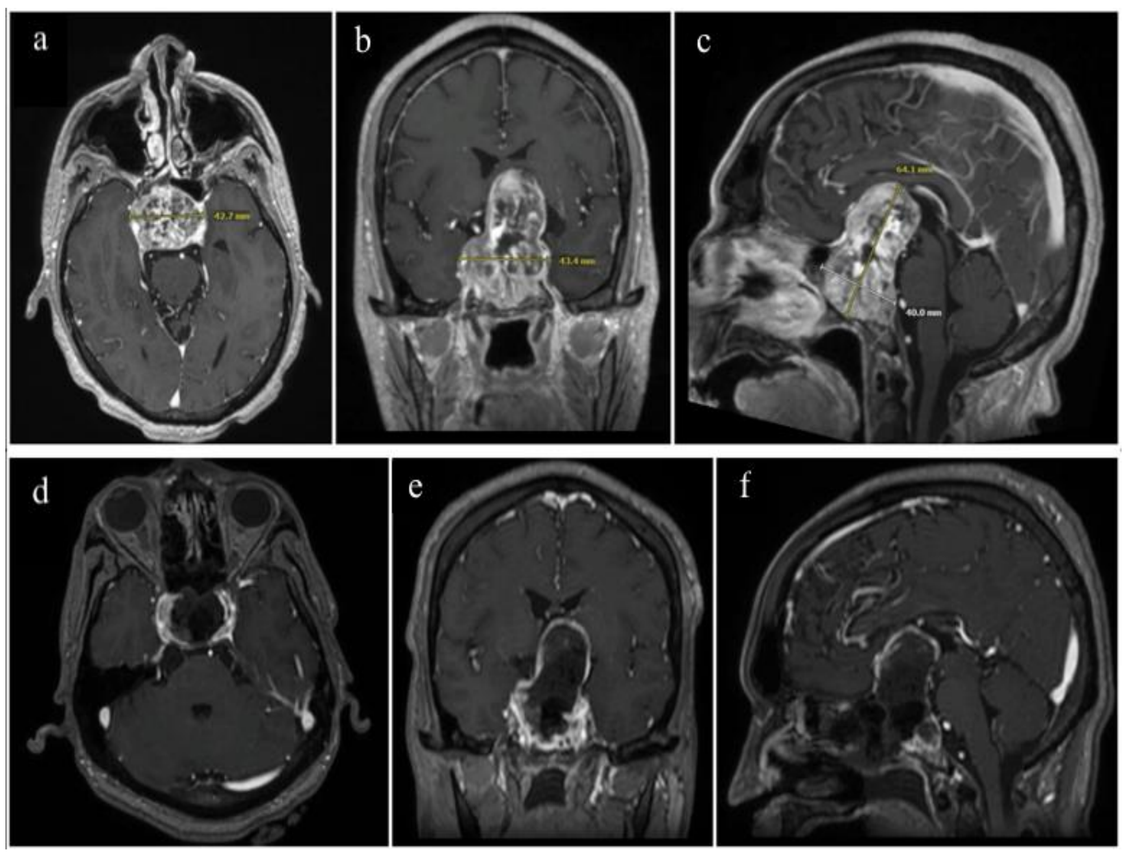

Figure 1. Preoperative (a, b and c) and postoperative (d, e and f) Brain MRI for Case 1.

Case 2

- **Patient:** 72-year-old male with an incidental sellar mass on imaging; history of metastatic prostate adenocarcinoma.
- **Findings:** MRI revealed a 26 × 16 × 19 mm sellar/suprasellar mass with sellar floor erosion and optic apparatus elevation.
- **Surgery:** Endoscopic endonasal approach achieved gross total resection; histopathology confirmed prostate adenocarcinoma metastasis within an FSH-secreting PitNET.
- **Post-op:** No complications; systemic progression led to weight loss, organ failure, and death within one year.

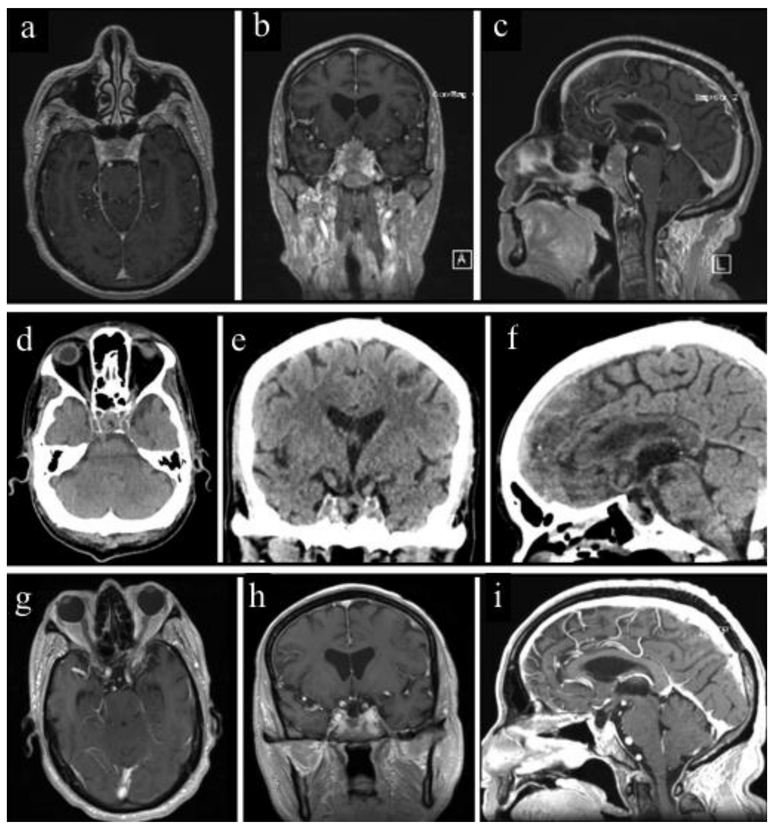

Figure 2. Case 2 pre-operative MRI (T1-weighted, axial, coronal, sagittal views) reveals a 26 × 16 × 19 mm heterogeneously enhancing sellar/suprasellar mass (a, b and c). Post-operative CT shows no bleeding, pneumocephalus, or complications (d, e and f), while post-operative MRI confirms gross total resection of the tumor (g, h and i).

Results

- **Study Selection:** Total of 38 cases identified after screening 408 citations.
- **Demographics:** Mean age 65 years; equal gender distribution.
- **Primary Tumor Origins:** Lung (21.1%), breast (18.4%), and colon (10.5%).
- **Symptoms:** Visual deficits (74%) were most common.
- **Surgical Approaches:** Endoscopic endonasal (37%) linked to longer survival (12 months).
- **Survival:** Median survival was 7 months; endoscopic surgery had the best outcomes.

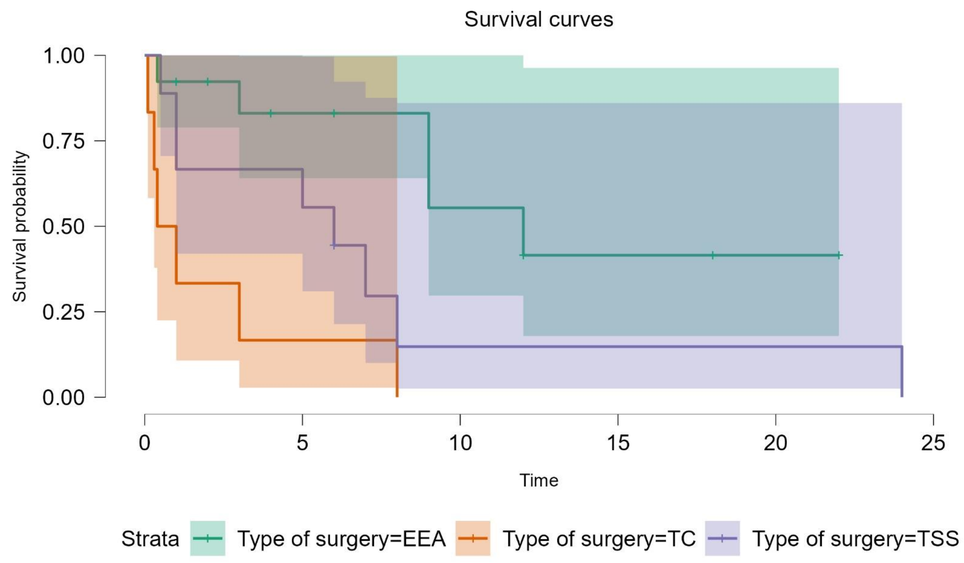

Figure 3. Kaplan-Meier survival curves show that endoscopic endonasal surgery is associated with the longest median survival (12 months), compared to transsphenoidal (6 months) and transcranial approaches (0.7 months) (p = 0.009).

Discussion

- **Key Indicators:** Rapid tumor growth, diverse enhancement patterns, and unique histological findings should raise suspicion.
- **Surgical Complexity:** Hypervascularity and disrupted anatomy from metastatic growth often limit complete resections.
- **Surgical Outcomes:** Endoscopic approaches showed lower complication rates and improved survival compared to transsphenoidal or transcranial methods. Overall, the choice of endoscopic approaches over other modalities has been proven beneficial to patients with PitNETs.
- **Pathophysiology:** Abnormal vasculature and neovascularization in PitNETs may facilitate metastatic spread.

Conclusions

Tumor-to-tumor metastasis in PitNETs is a rare and complex condition requiring a multidisciplinary approach for diagnosis and management. Endoscopic surgery offers superior outcomes, emphasizing its role as the gold standard for improving survival and minimizing complications.