

Metastasis of breast adenocarcinoma to pituitary adenoma

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Tumor-to-tumor intracranial metastasis is an uncommon phenomenon, and metastasis to pituitary adenoma is extremely rare.¹ Contrary to adenomas, which are the most frequent neoplastic lesions of the pituitary gland, and metastases to a normal pituitary gland, which account for 2% of all pituitary lesions, only about 35 cases of metastases to pituitary adenoma have been described.² The most frequently reported malignancies that metastasize to pituitary adenomas are lung, renal, and breast cancers.^{1,2} The prognosis for metastases to pituitary adenoma is poor due to the presence of advanced neoplastic disease.³

A 61-year-old woman was admitted to the department of neurosurgery due to hormonally nonfunctioning sellar mass, causing severe visual impairment and headaches over 2 to 3 months. The patient had been treated for 8 months for breast cancer with metastatic spread to bones and liver. She was treated with HER2-targeting monoclonal antibodies (pertuzumab and trastuzumab) in combination with docetaxel, and palliatively irradiated due to L4 vertebral body metastatic tumor. Magnetic resonance imaging (MRI) of the head, performed due to neurological symptoms, revealed a sellar mass with a significant suprasellar extension (FIGURE 1A). The tumor was larger compared with the previous image (6 months earlier), which was interpreted as asymptomatic pituitary macroadenoma (1.8 × 2 × 2.1 cm). Although the MRI results were consistent with the diagnosis of the pituitary macroadenoma, some intratumor lower signal intensity could suggest a collision tumor. The neurological examination revealed bitemporal visual field defects, while the hormonal profile showed only mild hyperprolactinemia (67 ng/ml; reference range, 3–23 ng/ml) and somatotrophic insufficiency (insulin-like growth factor-1, 43 ng/ml; reference range, 58–170 ng/ml for women older than 60 years of age). The patient underwent endoscopic transsphenoidal removal

of the lesion. The histopathological and immunohistochemical examination of the surgical specimen evidenced 2 distinct components: metastatic breast adenocarcinoma and oncocytic gonadotroph pituitary adenoma (FIGURE 1B–1G). The MIB-1 proliferation index was significantly different for both tumors (<1% adenoma vs >50% metastatic carcinoma). Metastatic tumor cells were positive for cytokeratin 7 and human epidermal growth factor receptor 2, and negative for progesterone receptors, p40 antigen, and thyroid transcription factor 1 (FIGURE 1C–1G). Immunostaining for follicle stimulating hormone and steroidogenic factor 1 in adenoma cells confirmed the diagnosis of gonadotroph pituitary tumor (FIGURE 1E and 1G). Electron microscopy revealed different ultrastructural features of both tumor components including cancer cells and pituitary adenoma (FIGURE 1H). After the surgery, the visual impairment and severe headaches resolved, the hormonal profile showed partial hypopituitarism (Supplementary material, Table S1). The patient underwent stereotactic radiation therapy for the sellar area (20 Gy). Over 1-year of postoperative follow-up showed no recurrence of the neoplastic process of both pituitary tumors. The relatively long survival time is unusual for similar cases.^{1,2}

The symptoms and imaging features of pituitary adenoma metastases are similar to those of pituitary adenoma tumors, with headaches and visual deterioration being the most commonly reported.^{1,3} For symptomatic cases, the treatment of choice is surgery, in order to decompress the optic chiasm and collect the tumor tissue for histopathological diagnosis.⁴

In patients with systemic neoplastic disease and previously diagnosed pituitary adenoma, the metastatic spread to the primary pituitary tumor should be included in the differential diagnosis. The histopathological analysis is crucial to demonstrate the 2 histologically distinct tumor components.

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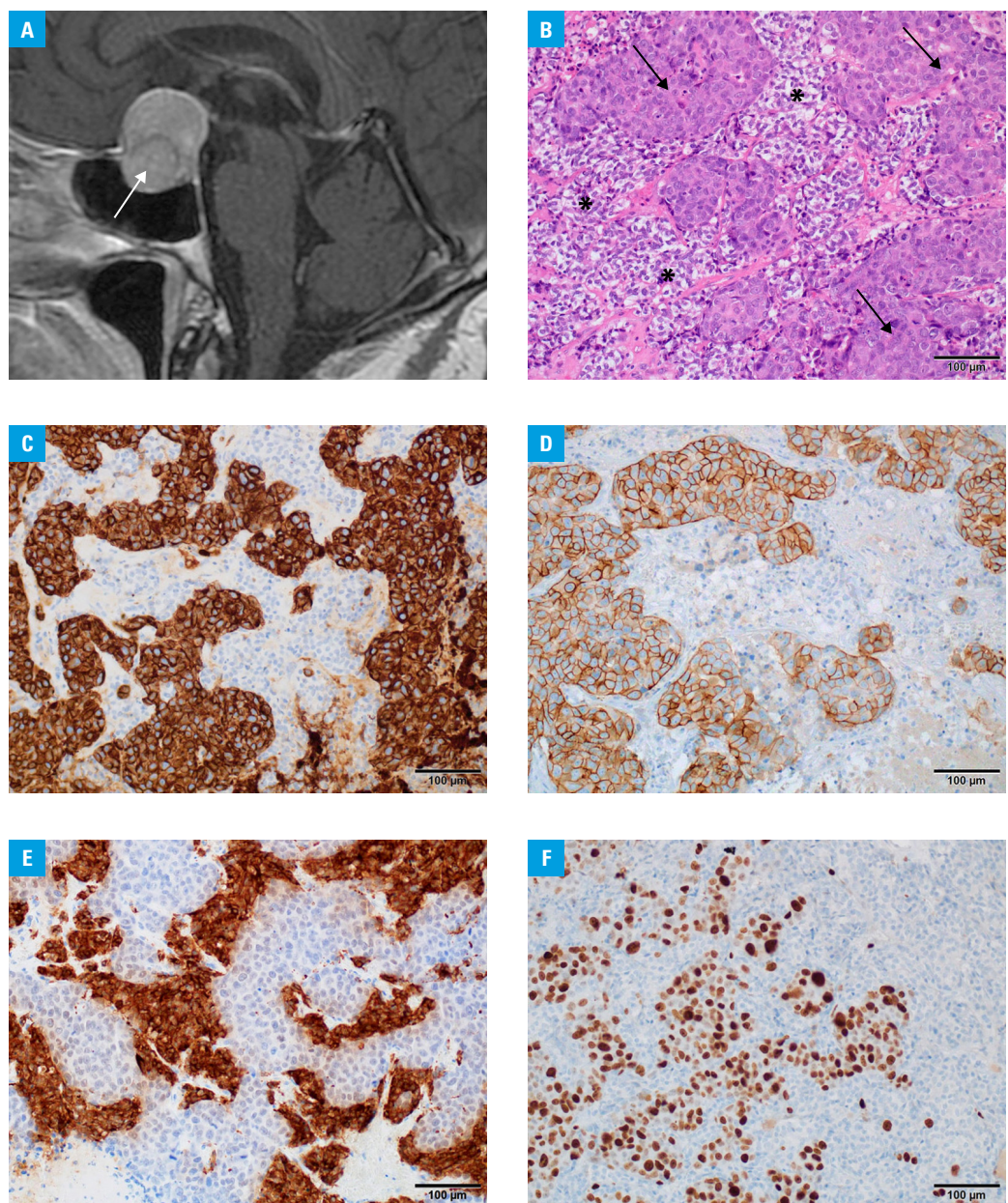


FIGURE 1 **A** – postcontrast magnetic resonance T1-weighted sagittal pituitary image demonstrating hyperintense pituitary mass with significant suprasellar extension with chiasmal and third ventricle compression; less intensive circular area in the central lower part of the tumor is visible, suggesting a collision tumor (arrow). **B** – histopathological findings: biphasic pattern of examined tumor tissue with nests of metastatic breast adenocarcinoma (arrows) surrounded by pituitary adenoma cells (asterisks). Adenocarcinoma cells are round or cuboid with strongly eosinophilic cytoplasm, pleomorphic nuclei, and prominent nucleoli. Pituitary adenoma cells are mostly uniform and exhibit oncocytic features with a pale, slightly granular cytoplasm (asterisks) (hematoxylin and eosin staining, magnification $\times 200$). **C** – strong immunoreactivity for cytokeratin 7 in metastatic cancer cells. The pituitary adenoma cells are immunonegative. **D** – strong cell membrane immunoreactivity for HER2 in metastatic adenocarcinoma cells and lack of staining in pituitary adenoma cells; **E** – cytoplasmic immunostaining for follicle stimulating hormone in pituitary adenoma cells, confirming the diagnosis of gonadotroph adenoma; **F** – high MIB-1 labeling index in the metastatic carcinoma (40% positive nuclei), compared to low index in the area of pituitary adenoma (approximately 1%)

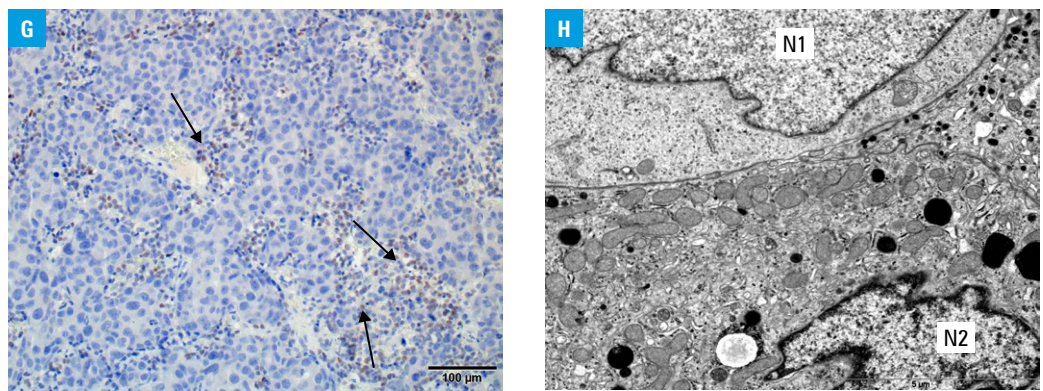


FIGURE 1 **G** – nuclei of pituitary adenoma cells immunopositive for steroidogenic factor 1, a nuclear transcription factor characteristic of the gonadotroph adenoma lineage (arrows); **H** – ultrastructural features of juxtaposition of oncocytic gonadotroph pituitary adenoma cells (lower) and metastatic adenocarcinoma cells (upper). N1, nucleus of carcinoma cell; N2, nucleus of pituitary adenoma (original magnification $\times 9700$)

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/paim.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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