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Case Report

Pituitary mass with cerebrospinal fluid seeding: A rare presentation of probable pituitary carcinoma: A case report.

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ABSTRACT

Introduction:

Pituitary carcinomas (PCs) are exceptionally rare neoplasms (0.1–0.2% of pituitary tumors), defined by metastatic spread and typically diagnosed in older adults. Presentation in adolescence is extraordinarily uncommon, and radiological evidence of cerebrospinal fluid (CSF) dissemination before histopathological confirmation is even rarer.

Case Presentation:

This case report discusses a 15-year-old female with hyperprolactinemia and progressive visual blurring. Contrast-enhanced MRI revealed a large (35 × 17 × 20 mm) hour-glass-shaped sellar mass with suprasellar extension, bilateral internal carotid artery encasement, and multiple enhancing nodular deposits in the ambient cisterns, findings consistent with a locally aggressive pituitary neoplasm and probable CSF dissemination.

Conclusion:

This case illustrates that pituitary carcinoma, though rare, should be considered in adolescents when MRI demonstrates aggressive features such as arterial encasement and leptomeningeal nodules. Early recognition of these imaging red flags is critical to expedite histopathological diagnosis and initiate multidisciplinary management.

Take Away Lessons:

(i) Hour-glass morphology and carotid encasement in a pediatric pituitary mass warrant suspicion for malignancy; (ii) Nodular CSF deposits in the ambient cisterns are highly suggestive of metastatic dissemination; (iii) MRI provides non-invasive clues that can guide timely biopsy and targeted therapy; (iv) Multidisplinary approach including counselling is required to thwart and or demisify cultral beliefs that may be a barrier to early diagnosis and treatment.

Keywords: *Pituitary carcinoma; adolescent; cerebrospinal fluid dissemination; MRI; temozolomide; aggressive pituitary tumor.*
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INTRODUCTION

Pituitary carcinomas (PCs) are defined by the presence of metastatic disease originating from adenohypophyseal cells. (1). They represent an extreme rarity among pituitary neoplasms, comprising only 0.1-0.2% of all pituitary tumors, and pose a significant diagnostic and therapeutic challenge due to their aggressive behavior and poor prognosis. (2). The diagnosis of PC is formally established only upon confirmation of metastasis to distant sites, such as the central nervous system via cerebrospinal fluid (CSF) pathways, or to systemic organs. (3). This diagnostic criterion inherently leads to delayed recognition, as early-stage disease is histologically indistinguishable from invasive pituitary adenomas (IPAs), which may exhibit similar features of local invasion, cellular atypia, and elevated mitotic activity without disseminated disease. (4)

The clinical presentation of PCs often mirrors that of their benign or invasive counterparts, primarily manifesting through mass effect symptoms such as visual disturbances from optic chiasm compression and/or hormone hypersecretion syndromes. (5). The majority of reported cases occur in middle-aged to older adults, with a mean age at diagnosis typically exceeding 50 years. (6). Presentation in adolescence is exceptionally uncommon, making the early suspicion of malignancy in young patients particularly difficult.

Recent advances in imaging have improved the detection of aggressive features, including cavernous sinus invasion, arterial encasement, and leptomeningeal dissemination, which should raise the index of suspicion

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for malignancy. (7). However, definitive diagnosis relies on histopathological confirmation, often supplemented by immunohistochemical (IHC) markers. The Ki-67 proliferation index, while not diagnostic alone, and the expression of O6-methylguanine-DNA methyltransferase (MGMT) are increasingly used to assess tumor aggressiveness and potential response to alkylating agents like temozolomide (TMZ) (8,9).

The management of PCs requires a multidisciplinary approach, as conventional treatments like surgery and radiotherapy often prove insufficient once metastasis has occurred. (10). Recent case reports and clinical guidelines suggest that TMZ, either as monotherapy or combined with radiotherapy, may offer a viable therapeutic option for aggressive pituitary tumors and carcinomas, highlighting a shift towards targeted chemotherapeutic strategies. (11,12).

This report describes a highly unusual case of a 15-year-old female presenting with an aggressive pituitary mass and radiological evidence of CSF seeding, a constellation of findings strongly suggestive of pituitary carcinoma. The case highlights the critical importance of recognizing malignant features in young patients, the necessity of a comprehensive diagnostic workup, and the potential role of novel therapeutic regimens in improving outcomes for this rare and devastating disease.

CASE PRESENTATION

A 15-year-old female presented with a several-month history of bilateral breast milk discharge and progressive visual blurring. Laboratory evaluation revealed elevated prolactin levels. Contrast-enhanced brain MRI demonstrated a large, hour-glass-shaped mass (35 × 17 × 20 mm) centered in the pituitary fossa (*Image 1)*, with suprasellar extension displacing the optic chiasm superiorly.

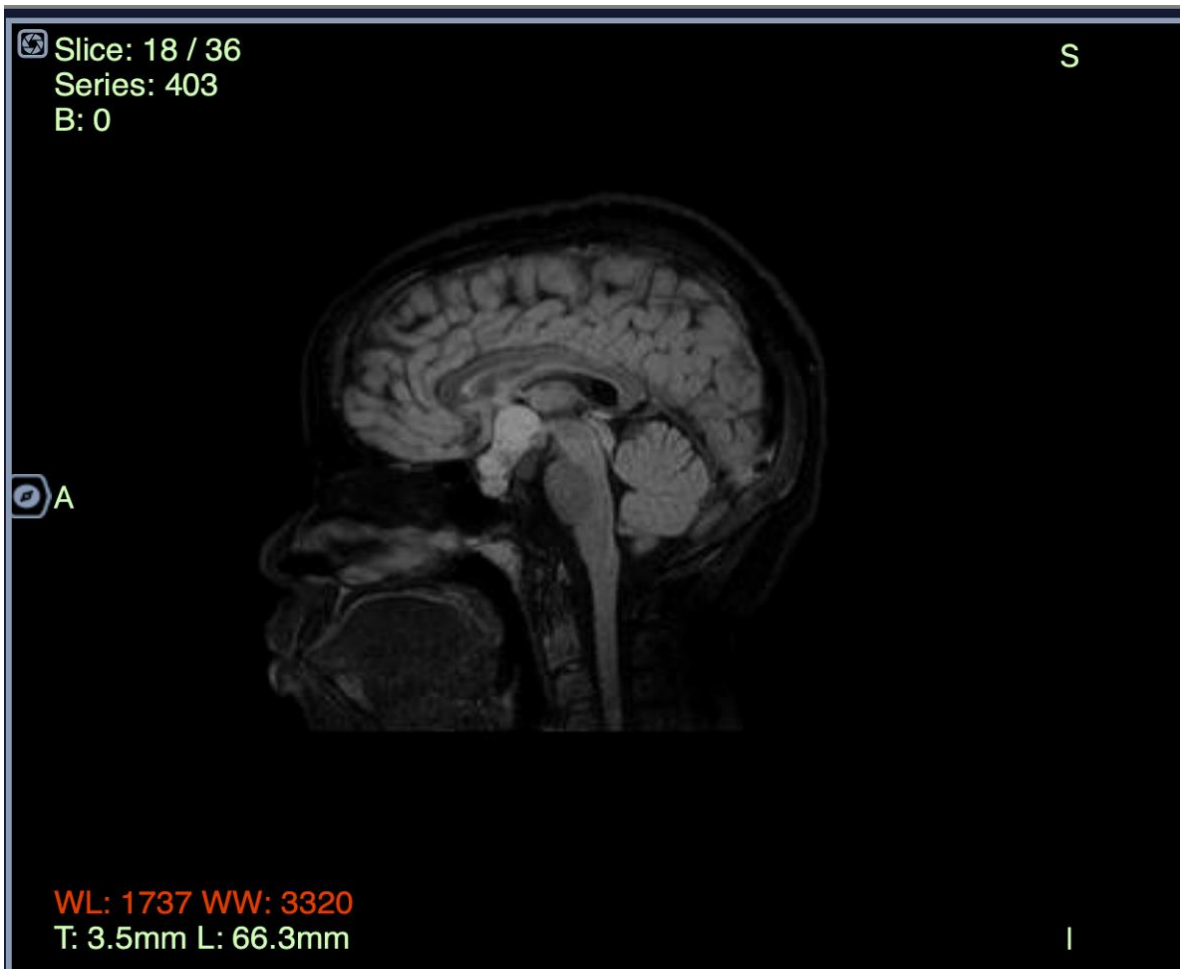

Image 1: Axial T2flair image showing the hour-glass-shaped mass centered in the pituitary fossa, with suprasellar extension.

The mass encased the clinoid and ophthalmic segments of both internal carotid arteries, more prominently on the right. Notably, multiple bilateral extra-axial nodular lesions were identified in the ambient cisterns, partially contiguous with the suprasellar component, measuring up to 2 cm and showing uniform contrast enhancement (*Image 2).*

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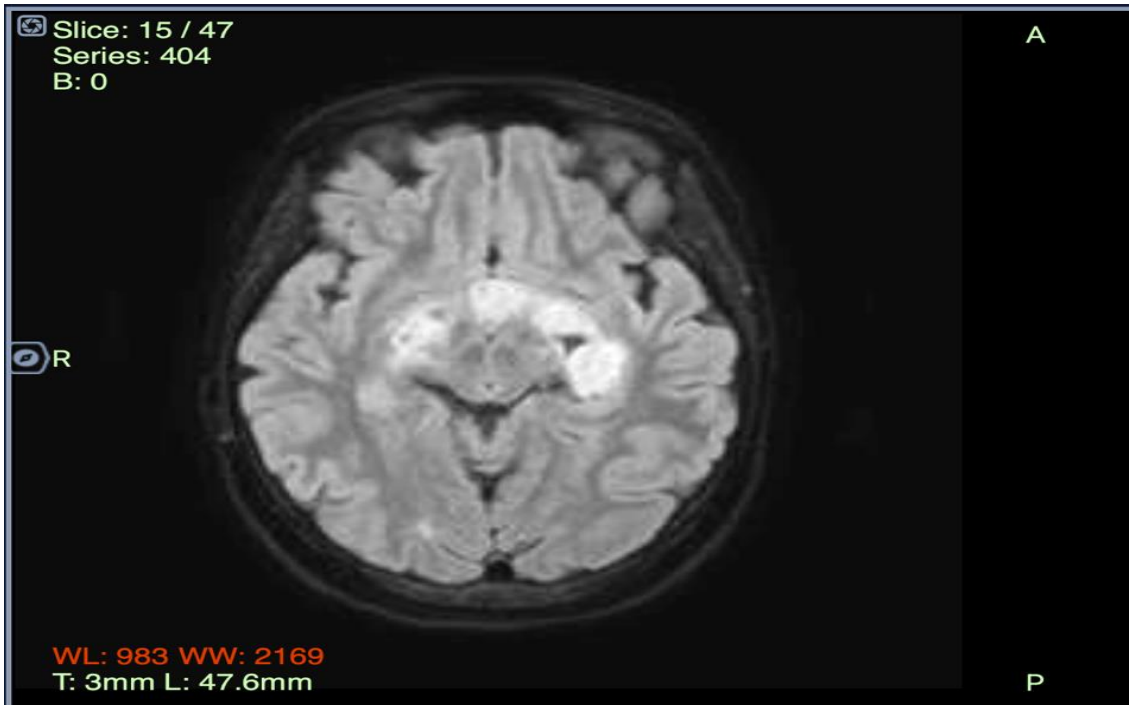

Image 2: Axial flair of the brain showing multiple bilateral extra-axial nodular lesions in the ambient cisterns, partially contiguous with the suprasellar component.

The mass was isointense on T1-weighted imaging, moderately hyperintense on T2-weighted and FLAIR sequences, with no restricted diffusion. The mass showed poor enhancement with contrast media administration (Figure 3).

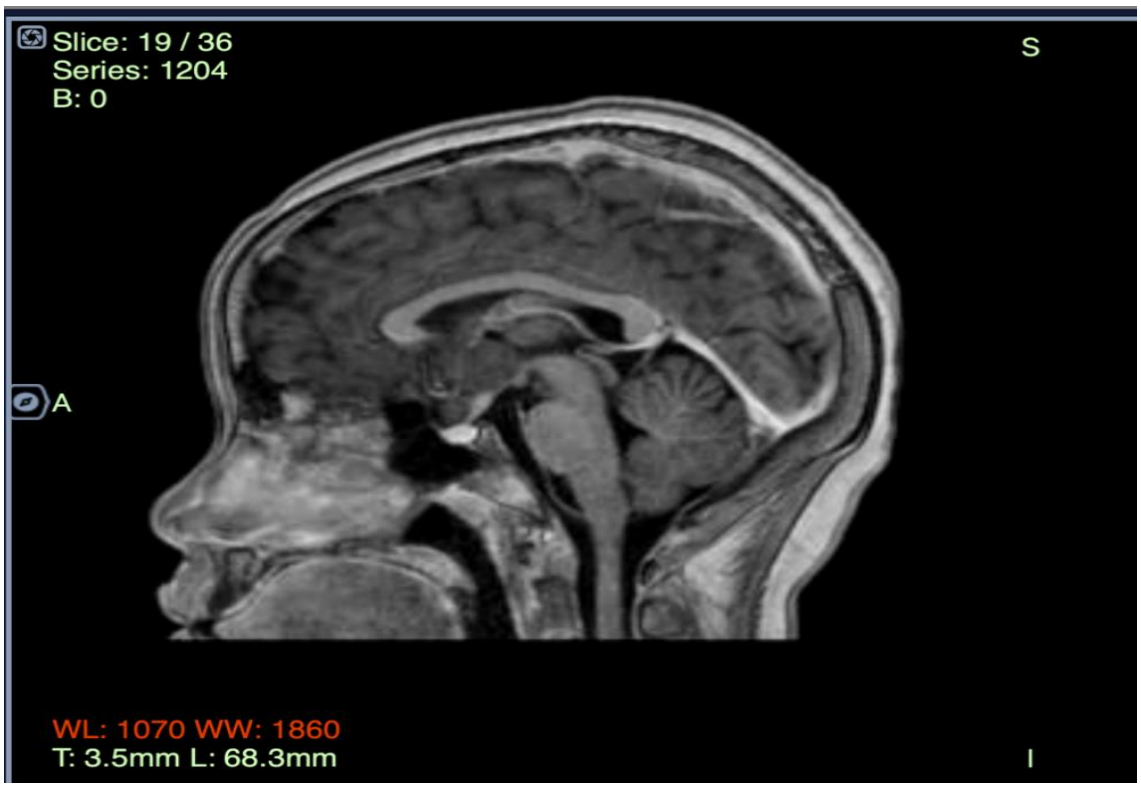

Image 3: Axial T1W + GD showing poor uptake of gadolinium contrast by the hour-glass-shaped mass centered in the pituitary fossa.

The MRI concluded that the findings were consistent with a locally aggressive pituitary neoplasm with probable CSF dissemination, suggestive of a malignant lesion such as pituitary adenocarcinoma.

Management of the patient: Patient was referred to a neurosurgeon at a national referral facility, and the options of tissue biopsy and cerebral spinal fluid analysis to confirm a diagnosis were discused but the caregiver, due to financial constraints and cultural beliefs on lumbar punctures, declined the procedures. At the time of publication, the caretaker was referred to a counsellor for further discussion on the matter, and the child was not on any treatment at that time.

DISCUSSION

This case is remarkable for several reasons. First, the patient's age (15 years) is atypical for pituitary carcinoma, which predominantly affects older adults. Second, the imaging findings, specifically the hour-glass morphology, arterial encasement, and nodular CSF deposits, are strongly indicative of an aggressive, malignant phenotype with leptomeningeal spread, a feature consistent with pituitary carcinoma as described in the literature. (2). The presence of CSF dissemination, in particular, aligns with cases of pituitary carcinoma that exhibit poor prognosis if not treated aggressively.(4).

The differential diagnosis includes invasive pituitary adenoma, but the ambient cistern nodules favor metastatic dissemination, supporting the suspicion of carcinoma. As noted by Du et al, (2). The diagnosis of PC is often delayed until metastases are identified, and conventional therapies may be ineffective. However, emerging evidence suggests that temozolomide (TMZ) combined with radiotherapy may offer a promising therapeutic avenue for such cases. In their reported case, a patient with CSF-disseminated sparsely granulated somatotroph carcinoma showed a favorable response to TMZ and whole-brain/spinal cord radiotherapy.

Given the aggressive features observed in this adolescent, a multidisciplinary approach involving endocrinology, neurosurgery, neuro-oncology, and radiation oncology is essential. Biopsy for histopathological confirmation, including immunohistochemistry for pituitary hormones, Ki-67 index, and MGMT expression, is recommended to guide therapy. (7). If confirmed as a carcinoma, TMZ-based chemotherapy with adjuvant radiotherapy could be considered, as supported by recent guidelines and case reports.

TAKE HOME POINTS

1. **Imaging red flags for malignancy:** Hour-glass morphology, internal carotid artery encasement, and extra-axial nodular deposits in the ambient cisterns are MRI features that should raise suspicion for pituitary carcinoma, even in atypical age groups.
2. **CSF dissemination as a diagnostic clue:** The presence of enhancing leptomeningeal nodules, particularly when partially contiguous with the primary sellar mass, strongly suggests metastatic spread and obviates the need for histopathological confirmation of metastasis to establish a diagnosis of carcinoma.
3. **Pediatric consideration:** Although pituitary carcinoma is exceptionally rare in adolescence, this case demonstrates that age alone should not preclude its consideration when imaging depicts unequivocally aggressive features.
4. **Radiological-guided management:** MRI findings of probable CSF dissemination can expedite referral for biopsy, prompt immunohistochemical profiling, and inform early use of temozolomide-based therapy, potentially improving outcomes in this otherwise poor-prognosis disease.
5. **Multidisciplinary approach:** In certain instances, there is a need for a multidisciplinary approach, especially when cultural beliefs and norms stand in the way of appropriate treatment, as shown in this case.

CONCLUSION

The case study shows a highly unusual case of a young female with an aggressive pituitary mass and imaging evidence of CSF seeding, suggestive of pituitary carcinoma. This presentation highlights the importance of recognizing malignant features on MRI in pediatric and adolescent patients with pituitary lesions. Early histopathological diagnosis and a multidisciplinary treatment strategy, potentially incorporating TMZ and radiotherapy as well as intensive counselling, are critical for improving outcomes in these rare and challenging cases.

LIST OF ABBREVIATIONS

1. **CSF**: Cerebrospinal fluid
2. **MRI**: Magnetic resonance imaging
3. **PC**: Pituitary carcinoma
4. **IPA**: Invasive pituitary adenoma
5. **IHC**: Immunohistochemical
6. **MGMT**: O6-methylguanine-DNA methyltransferase
7. **TMZ**: Temozolomide
8. **FLAIR**: Fluid-attenuated inversion recovery
9. **T1W** : T1-weighted
10. **GD**: Gadolinium
11. **ECU**: Ernest Cook University
12. **KAMRIC**: Kampala MRI Centre

DECLARATIONS

Author Contributions

All the authors contributed to the drafting of the above manuscript. AN came up with the concept idea, case write-up, final drafting, grammar check, and literature review, and KN contributed to the discussion as well as supervising the whole drafting process. Both authors participated in writing the patient's radiological report.

Author biography

Ampuriire Nyakubaho is an Assistant Lecturer at the Department of Anatomy and is also the Chief Radiology

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Conflict of interests.
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Data Availability Statement
The data that supports the findings of this case report are available from the corresponding author upon reasonable request.

Participant consent
The pateints caretaker (father) was informed about the need to use the findings of the scan for learning, education, and publishing purposes, and consent was granted.

Ethics approval
Informed consent was obtained from the caretaker of the patient for this publication.

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