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Case Report

Neglected Giant Pituitary Adenoma: A Unique Case Report

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Abstract

A 44-year-old male who had been diagnosed with a prolactin-secreting pituitary adenoma 13 years earlier remained untreated, resulting in progressive enlargement of the lesion into a giant invasive tumor. Magnetic resonance imaging revealed a 68 × 72 mm solid–cystic mass extending from the clivus to the suprasellar cistern and right cavernous sinus, with circumferential encasement of the internal carotid artery. The patient presented with progressive visual impairment and headache. Surgical resection was performed via a right pterional craniotomy, and histopathology confirmed prolactinoma. This case highlights that even histologically benign pituitary neuroendocrine tumors can become aggressive and invasive when left untreated, underscoring the importance of early diagnosis, adherence to medical therapy, and timely surgical intervention to prevent irreversible neuro-ophthalmologic complications.

Keywords

Pituitary adenoma, Pituitary neuroendocrine tumor, Giant prolactinoma, Invasive tumor, Transcranial surgery

Article History

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1. Introduction

Pituitary adenomas have been reclassified as pituitary neuroendocrine tumors (PitNETs) according to the 2022/2023 World Health Organization (WHO) guidelines. These tumors are common intracranial neoplasms and account for approximately 10–15% of all brain tumors [1-3]. Although histologically benign, these lesions may demonstrate expansive and invasive behavior, extending into the optic apparatus, cavernous sinus, carotid artery, and skull base structures. Giant pituitary adenomas (GPAs), typically defined as those exceeding 4 cm in diameter, represent approximately 6–10% of all pituitary tumors [4,5]. While non-functioning adenomas comprise the majority of GPAs, prolactin-secreting subtypes remain clinically important due to their responsiveness to dopamine agonists and potential for severe visual compromise if untreated.

Recent updates in PitNET classification incorporate transcription factor profiling, proliferative markers, and molecular features, providing better prognostic discrimination than the previous adenoma-based categorization [2]. This modern terminology emphasizes their neuroendocrine origin and variable aggressive potential.

Applications of artificial intelligence (AI), including machine learning (ML) and deep learning (DL), have expanded rapidly in the fields of neuroimaging, endocrine oncology, and neurosurgical planning. DL-based automated tumor segmentation improves preoperative evaluation, while ML algorithms may assist in differential diagnosis, prediction of tumor invasiveness, and forecasting of visual outcomes. Although routine clinical implementation is still emerging, recent meta-analyses have demonstrated the potential of AI-based tools to enhance diagnostic accuracy and support individualized treatment strategies for pituitary tumors [6,7].

A recent systematic review and meta-analysis specifically evaluating ML-based prediction of pituitary adenoma recurrence demonstrated high pooled diagnostic performance, underscoring the potential of AI-assisted decision tools in PitNET management [6].

Another contemporary meta-analysis further emphasized the expanding clinical utility of AI-based models in endocrine and neurosurgical practice, particularly for complex pituitary tumors [7].

Here, we present a rare case of a prolactinoma neglected for 13 years, which progressed into an invasive giant PitNET with extensive skull base and vascular involvement, ultimately requiring a transcranial approach.

2. Case Report

Clinical presentation

A 44-year-old male presented with progressive visual deterioration and headache.

Neurological examination showed the patient was cooperative and oriented.

The right pupil was mid-dilated and non-reactive to light, while the left pupil exhibited a normal light reflex. There was no motor deficit.

Neuro-ophthalmologic evaluation revealed right-eye visual acuity limited to finger counting at 2 meters and complete visual field loss consistent with optic atrophy.

The left eye exhibited normal visual acuity but demonstrated nasal hemianopsia.

Endocrine evaluation

Serum prolactin levels were markedly elevated at greater than 200 μg/L. Additional hormonal assessment revealed suppressed adrenocorticotropic hormone (ACTH) levels below 5 pg/mL and low cortisol levels of 0.5 μg/dL. Total testosterone was 3.58 nmol/L. Thyroid-stimulating hormone (TSH) was 0.33 μIU/mL, free triiodothyronine was 3.36 ng/L, and free thyroxine was 0.89 ng/dL. Follicle-stimulating hormone (FSH) was 3.99 IU/L, and growth hormone (GH) was 0.68 ng/mL. The patient reported inconsistent use of cabergoline in the past.

Imaging findings

Computed tomography (CT) and magnetic resonance imaging (MRI) performed in 2007 demonstrated a smaller lesion confined to the sella (Figure 1). Magnetic resonance imaging obtained in 2019 revealed a giant mass measuring approximately 68 × 72 mm with solid and cystic components. The lesion extended into the suprasellar cistern, right cavernous sinus, midbrain, and pons (Figure 2). The tumor completely encased the cavernous and supraclinoid segments of the internal carotid artery (ICA) and compressed the right middle cerebral artery and A1 segments. Magnetic resonance angiography confirmed circumferential encasement of the ICA (Figure 3).

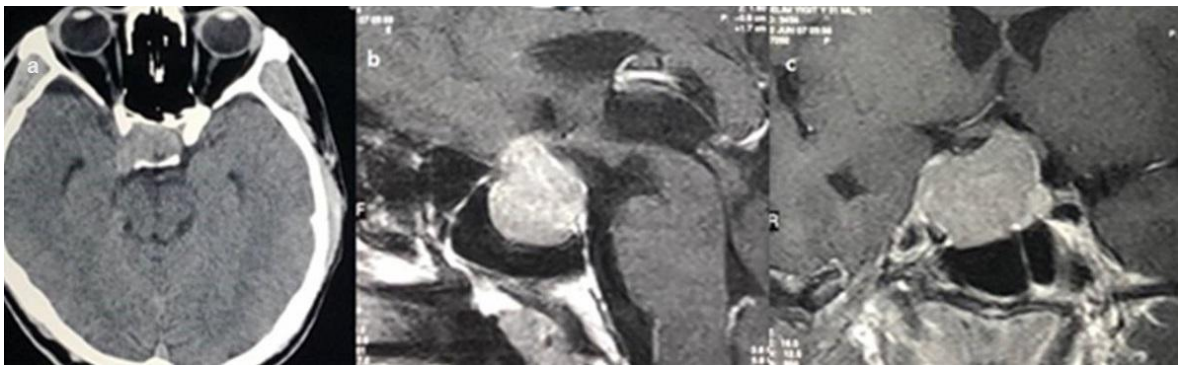

Figure 1. Axial CT (a) and post-contrast T1-weighted sagittal and coronal MR images (b, c) obtained in 2007.

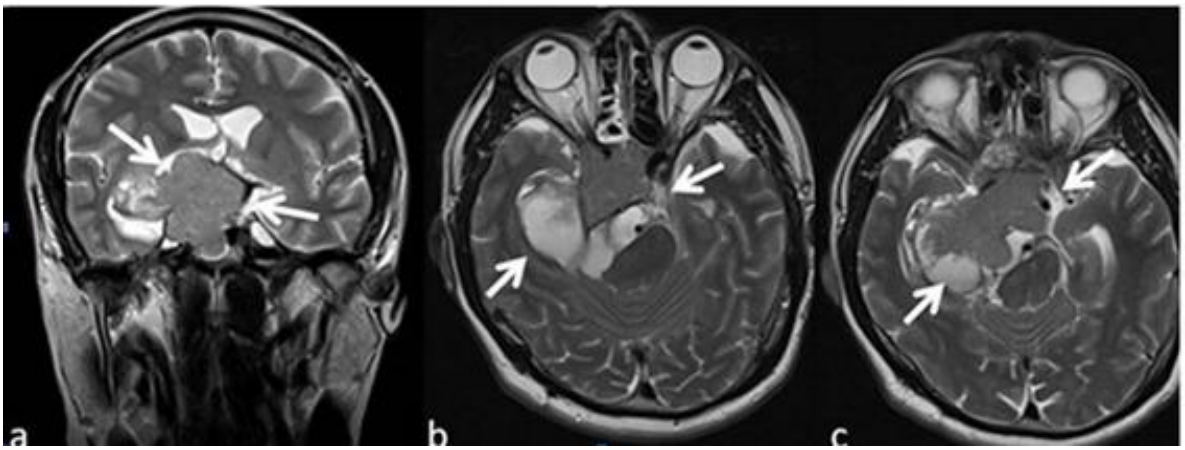

Figure 2. T2-weighted coronal (a) and axial (b, c) MR images obtained in 2019, showing a giant solid–cystic mass filling the sella turcica and extending into the suprasellar cistern (white arrows).

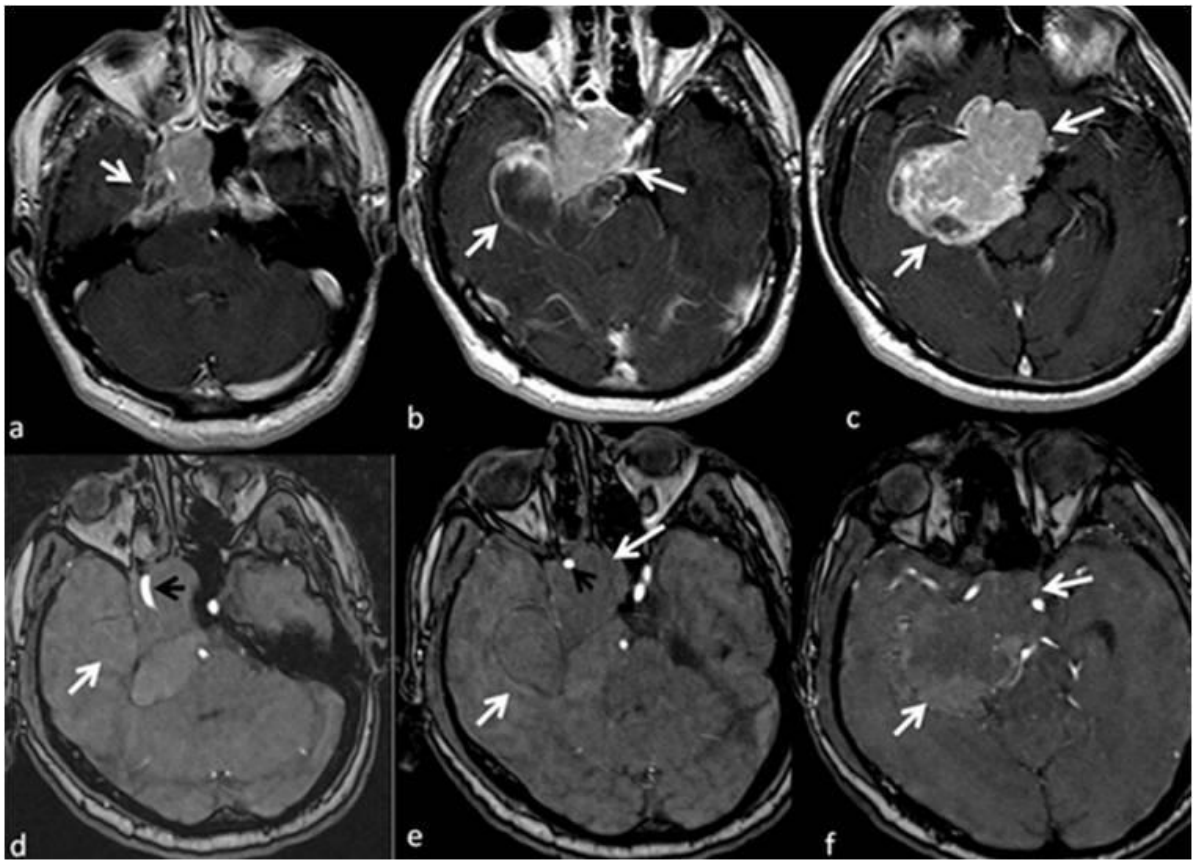

Figure 3. Post-contrast T1-weighted (a–c) and TOF MR angiography images (d–f) obtained in 2019, showing a giant mass (white arrows) completely encircling the cavernous and supraclinoid segments of the internal carotid artery and invading the right cavernous sinus (black arrow).

Surgical management

Due to extensive parasellar, retroclival, and vascular invasion, an endoscopic transsphenoidal approach was considered insufficient. A right pterional craniotomy was therefore performed to achieve improved exposure for optic nerve decompression and vascular dissection. No intraoperative complications occurred. Histopathological examination confirmed the diagnosis of prolactinoma.

Vital signs

Vital signs remained stable and within normal limits throughout both the preoperative and postoperative periods.

Postoperative course and outcome

Early postoperative prolactin levels remained above 200 µg/L. Growth hormone was measured at 0.34 ng/mL, and cortisol at 2.6 µg/dL. Cabergoline therapy at a dose of 0.5 mg twice weekly was continued. At nine months of follow-up, serum prolactin levels had decreased to 45 µg/L.

Postoperatively, partial visual recovery was observed. Visual function in the left eye improved significantly, whereas recovery in the right eye was minimal due to pre-existing optic atrophy. Long-term clinical and radiological follow-up data were unavailable because the patient did not continue routine postoperative care at our institution.

3. Discussion

Giant prolactinomas are rare but clinically significant tumors because of their aggressive growth potential, mass effect, and the risk of delayed diagnosis. In the present case, a 13-year treatment gap resulted in tumor enlargement to a size of 68 × 72 mm. This dimension exceeds the typical size range reported in most giant prolactinoma series, in which lesions usually measure 40–50 mm and only a small proportion exceed 70 mm [1,5,8].

Early classifications by Pia and colleagues first emphasized the surgical complexity of giant pituitary adenomas, particularly those with suprasellar and parasellar extension. These observations formed the foundation for later modern definitions [9]. In the current case, invasiveness was characterized by cavernous sinus infiltration, circumferential encasement of the internal carotid artery, and posterior extension toward the midbrain and pons. These features are consistent with the highly invasive subgroup described in large surgical series [5,10].

The duration of untreated disease in this patient is exceptionally long. Most reported cases of neglected prolactinomas describe diagnostic or therapeutic delays of 2 to 5 years before significant progression becomes evident. Visual impairment and cavernous sinus invasion are well-recognized consequences of delayed therapy. However, circumferential internal carotid artery encasement with supraclinoid extension, as observed in this patient, remains uncommon and is associated with increased surgical risk. In the cohort reported by Gaillard and colleagues, only 18% of giant adenomas demonstrated complete internal carotid artery encasement [8].

Consistent with classical series such as Garibi et al. (2002), giant pituitary adenomas frequently present with severe visual impairment and variable degrees of hypopituitarism due to mass effect [11]. Dopamine agonists remain the first-line therapy for prolactinomas and are effective in shrinking even giant lesions in 70–90% of patients [12]. Inconsistent or absent medical therapy, as in the present case, can significantly diminish treatment efficacy and allow progressive tumor growth. Prolonged chiasmal compression often results in irreversible visual loss, and chronic optic atrophy in the right eye explains the limited postoperative recovery observed in this patient.

Earlier series, such as the report by Matsuyama et al., also highlighted that suprasellar extension and complex superior growth patterns often necessitate individualized surgical strategies in large and giant pituitary adenomas [13]. Table 1 summarizes relevant literature.

Table 1. Summary of major giant prolactinoma series.

Study	n	Max tumor size	ICA encasement rate	Cavernous sinus invasion	Treatment	Key findings
[5]	108	60 mm	14%	72%	Endoscopic	High visual improvement rate
[8]	49	52 mm	18%	64%	Mixed	ICA encasement predicts morbidity
[10]	239	55 mm	10%	68%	Endoscopic	Low mortality, good outcomes
[14]	95	50 mm	Not reported	70%	Transcranial	Required in 10–15% of cases

Although endoscopic transsphenoidal surgery is currently the preferred approach for most large and giant pituitary adenomas, transcranial surgery remains necessary in selected cases. Indications include multilobulated suprasellar extension, lateral invasion beyond the internal carotid artery, posterior fossa or retroclival extension, circumferential

vascular encasement, and firm tumor consistency. The presence of multiple high-risk features in this patient justified the use of a transcranial approach, in line with previously published surgical series [5,8,11,15].

However, transcranial surgery remains essential for select cases. Indications include multilobulated suprasellar extension, lateral invasion beyond the ICA, retroclival or posterior fossa extension, vascular encasement (particularly circumferential ICA involvement), and firm or fibrous tumor consistency. Our patient fulfilled multiple criteria, especially complete ICA encasement and extension toward the midbrain, making an endoscopic approach unsafe and insufficient. This aligns with Mortini et al. (95 cases), who noted that transcranial routes remain necessary in 10–15% of giant adenomas despite advancements in endoscopic techniques [14].

Visual improvement after decompression largely depends on the chronicity of chiasmal compression. Omay et al. showed that optic nerve atrophy strongly predicts limited postoperative recovery. In our case, the left eye demonstrated meaningful improvement, while the right eye showing preoperative atrophy had minimal recovery, consistent with established prognostic data [16].

Recent systematic reviews and meta-analyses have demonstrated that AI-based models can predict tumor invasiveness, postoperative outcomes, and recurrence risk with high accuracy [6,7]. These tools may become valuable adjuncts to conventional radiological assessment, particularly in complex cases such as giant prolactinomas with vascular involvement.

4. Conclusion

This case illustrates that prolactin-secreting pituitary neuroendocrine tumors, despite their histologically benign nature, may undergo marked enlargement and develop highly invasive characteristics when left untreated for prolonged periods. Delayed or inconsistent medical therapy can permit continuous tumor progression, leading to irreversible visual impairment, extensive skull base invasion, and the need for complex transcranial surgery rather than standard minimally invasive approaches.

Early diagnosis, adherence to dopamine agonist therapy, and timely surgical intervention remain the cornerstones of effective management. Multidisciplinary evaluation involving endocrinology, neurosurgery, neuro-ophthalmology, and radiology is essential to optimize outcomes, particularly in cases with vascular encasement or significant mass effect. Patient education and individualized counseling are also critical to ensure long-term treatment compliance.

Although postoperative visual improvement was achieved in the left eye, chronic compression resulted in permanent optic atrophy on the right side, underscoring the importance of early intervention. Unfortunately, long-term clinical and radiological follow-up data remain unavailable, as the patient did not continue routine postoperative care at our institution.

Ultimately, this case underscores the necessity of prompt diagnosis, continuous follow-up, and patient-centered management strategies to prevent avoidable morbidity in prolactin-secreting PitNETs and to maximize both visual and endocrine recovery.

Conflict of Interest

The authors declare no conflict of interest.

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Generative AI Statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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