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Case Report

Dual hormone-secreting pediatric pituitary adenoma: a case report and surgical management

Adenoma hipofisiario pediátrico con secreción dual de hormonas: reporte de caso y manejo quirúrgico

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ABSTRACT

Pituitary adenomas are rare in pediatric populations representing only 2–6% of intracranial neoplasms, yet recent reports suggest an increasing incidence with more aggressive features, larger size, and earlier onset compared to adults. We present the case of a 10-year-old female with dual hypersecretion of growth hormone and prolactin who developed tall stature, galactorrhea, headache, visual disturbances, and neurological deficits. Magnetic resonance imaging revealed a sellar mass measuring 4.36 × 3.5 × 3.3 cm, and immunohistochemistry confirmed positivity for growth hormone and prolactin with a Ki-67 index of 2%. The patient underwent an initial craniofacial transcranial resection, but biochemical and radiological recurrence required a second surgery via endoscopic endonasal approach, achieving near-total removal of the tumor. This case illustrates the clinical complexity of pediatric pituitary adenomas with dual hormonal secretion, emphasizes the importance of multidisciplinary management and long-term follow-up, and highlights the advantages of endoscopic endonasal surgery in achieving superior resection rates and lower recurrence compared to traditional approaches.

Keywords: *adenoma; signs and symptoms; prolactin; hormones; neurosurgery; craniotomy*

RESUMEN

Los adenomas pituitarios son neoplasias poco frecuentes en la población pediátrica, representando únicamente entre el 2 y el 6% de las neoplasias intracraneales; sin embargo, en los últimos años se ha reportado un incremento en su incidencia, con características más agresivas, mayor tamaño y aparición en edades más tempranas. Presentamos el caso de una paciente femenina de 10 años con hipersecreción dual de hormona de crecimiento y prolactina, que desarrolló talla alta, galactorrea, cefalea, alteraciones visuales y déficit neurológicos. La resonancia magnética evidenció una lesión selar de 4.36 × 3.5 × 3.3 cm, y la inmunohistoquímica confirmó hipersecreción de la hormona de crecimiento y prolactina, con un índice Ki-67 del 2%. La paciente fue sometida inicialmente a una resección transcraneal, pero presentó recurrencia bioquímica e imagenológica que requirió un segundo procedimiento quirúrgico por vía endoscópica endonasal, logrando una resección ≥95% de la masa tumoral. Este caso ilustra la complejidad clínica de los adenomas pituitarios pediátricos con secreción hormonal dual, resalta la importancia del abordaje multidisciplinario y del seguimiento prolongado, y subraya las ventajas de la cirugía endoscópica endonasal en términos de control tumoral y menor recurrencia frente a técnicas tradicionales.

Palabras clave: *adenomas; signos y síntomas; prolactina; hormonas; neurocirugía; craneotomía.*

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1 INTRODUCTION

Pituitary adenomas are histologically benign tumors arising from pituitary tissue[1]. Their clinical manifestations result either from compression of adjacent structures—including the optic nerves, optic chiasm, carotid arteries, and cranial nerves[1]—or from excessive secretion of pituitary hormones[2]. Based on size, they are classified as microadenomas (10 mm), and giant adenomas (>40 mm)[2]. Tumor size is directly correlated with compressive symptoms, with headache and visual disturbances being the most common presentations[1,3]. Furthermore, approximately 90% of pituitary adenomas are reported to be hormonally active[1], leading to clinical syndromes secondary to hormone hypersecretion. The primary goal of management is to restore hormonal balance, with available therapeutic options including medical treatment, surgery, and radiotherapy[1].

Pituitary adenomas are rare in childhood and adolescence, accounting for 2–6% of all intracranial neoplasms within this age group[2]. Their incidence is estimated at 0.1 per million children, with a prevalence of 1 per million[4]. Pediatric pituitary adenomas often exhibit more aggressive behavior, characterized by increased hormonal hypersecretion that complicates treatment[3]. Among pediatric patients, prolactinomas are the most frequent subtype, followed by adrenocorticotropic hormone (ACTH)-secreting and growth hormone (GH)-secreting adenomas[4,5]. GH-secreting adenomas annual prevalence is estimated 29-37 patients per million children aged 0-17 years[6]. The incidence decreases further in cases of adenomas secreting two hormones, for which epidemiological data are currently unavailable due to low frequency.

This study reports a case of a pediatric patient with a growth hormone- and prolactin-secreting macroadenoma, managed through a two-stage surgical approach.

This work is a case report, therefore approval from an Ethics Committee was not required. Only signed informed consent from the patients was obtained for academic use of their clinical information.

2 CASE PRESENTATION

Case report

A 10-year-old female patient was presented with perinatal history of a full-term, normoevolutive pregnancy, birth weight of 2,125 g, and one week of incubator care due to hyperbilirubinemia. Gynecological history included thelarche one year prior, with no menarche to date. Family history was notable for paternal grandmother with breast cancer and thyroid cancer, maternal grandmother with systemic arterial hypertension and thyroid dysfunction, and maternal grandfather with prostate cancer.

The patient reported symptom onset in December 2023 (Figure 1), characterized by left eye paresis, pain in the left lower limb, headache, galactorrhea, tall stature, weight loss, and striae on the back and lower limbs. Physical examination revealed a chiasmatic syndrome with bitemporal hemianopsia, hemiparesis, and aphasia. Hormonal profile and cranial magnetic resonance imaging (MRI) were requested (Figure 2).

Hormonal profile showed prolactin 28.30 ng/mL, TSH 0.92 µIU/mL, free T4 0.55 ng/dL, free T3 4.6 pg/mL, LH 0.3 mIU/mL, and FSH 1.96 mIU/mL. MRI revealed a sellar lesion measuring 4.36 × 3.5 × 3.3 cm. Based on these findings, a pituitary adenoma producing growth hormone (HGH, 95%) and prolactin (20%) was diagnosed with immunophenotype positive for HGH and prolactin, negative for ACTH, FSH, and TSH, and a Ki-67 proliferation index of 2%.

On February 5, 2024, preoperative laboratory studies were obtained: creatinine 0.47 mg/dL, BUN 5.6 mg/dL, uric acid 2.9 mg/dL, total cholesterol 259 mg/dL, triglycerides 159 mg/dL, HDL cholesterol 51.3 mg/dL, LDL cholesterol 196 mg/dL, AST 16.6 U/L, ALT 22.3 U/L, alkaline phosphatase 22.3 U/L, phosphorus 6.4 mg/dL, magnesium 2.4 mg/dL, calcium 9.7 mg/dL, sodium 138 mmol/L, potassium 3.8 mmol/L, chloride 100.3 mmol/L, growth hormone >100 ng/mL, ACTH 19.09 pg/mL, and IGF-1 658.2 ng/mL. On February 29, a right pterional navigated craniotomy was performed. The procedure included a frontemporal cutaneous incision and shaving of the desired area followed by the dissection of muscles, aponeurosis and subcutaneous tissue below the scalp. Subsequently, using a craniotome, several holes were made into de skull and with a Penfield dissector the dura was separated. Tumor delimitation was made using neuronavigation, achieving almost 50% of tumor resection with radiofrequency ablation of the tumor bed, and dural repair with graft.

Postoperative studies on March 12 revealed LDL cholesterol 268.3 mg/dL, VLDL cholesterol 75 mg/dL, ALY 56.5, glucose 109 mg/dL, total cholesterol 382 mg/dL, triglycerides 378 mg/dL, hemoglobin 11.1 g/dL, hematocrit 94, MCH 29, MCHC 31, platelets 403,000/µL, calcium 10.3 mg/dL, phosphorus 5.2 mg/dL,

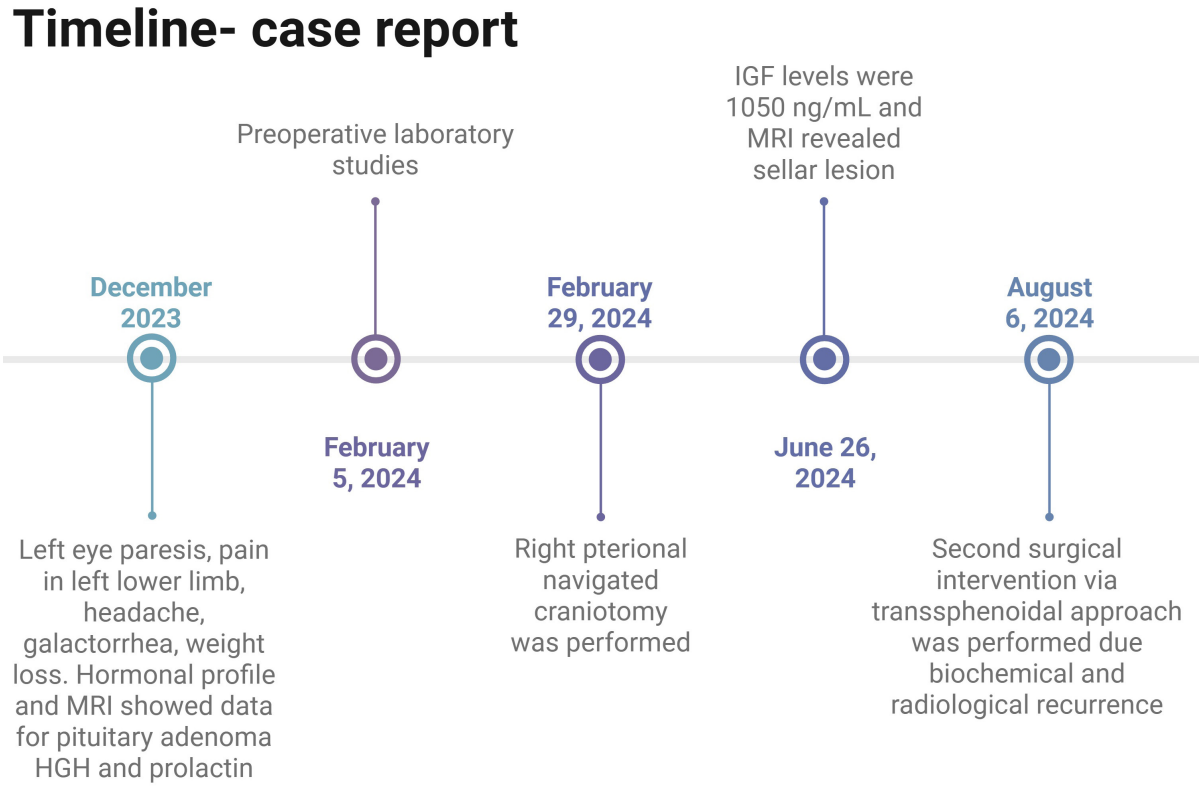

Figure 1. Clinical timeline. Chronological overview of the patient´s clinical course, from the initial diagnosis of a pituitary adenoma and first craniotomy, to tumor recurrence and the second transsphenoidal surgery.

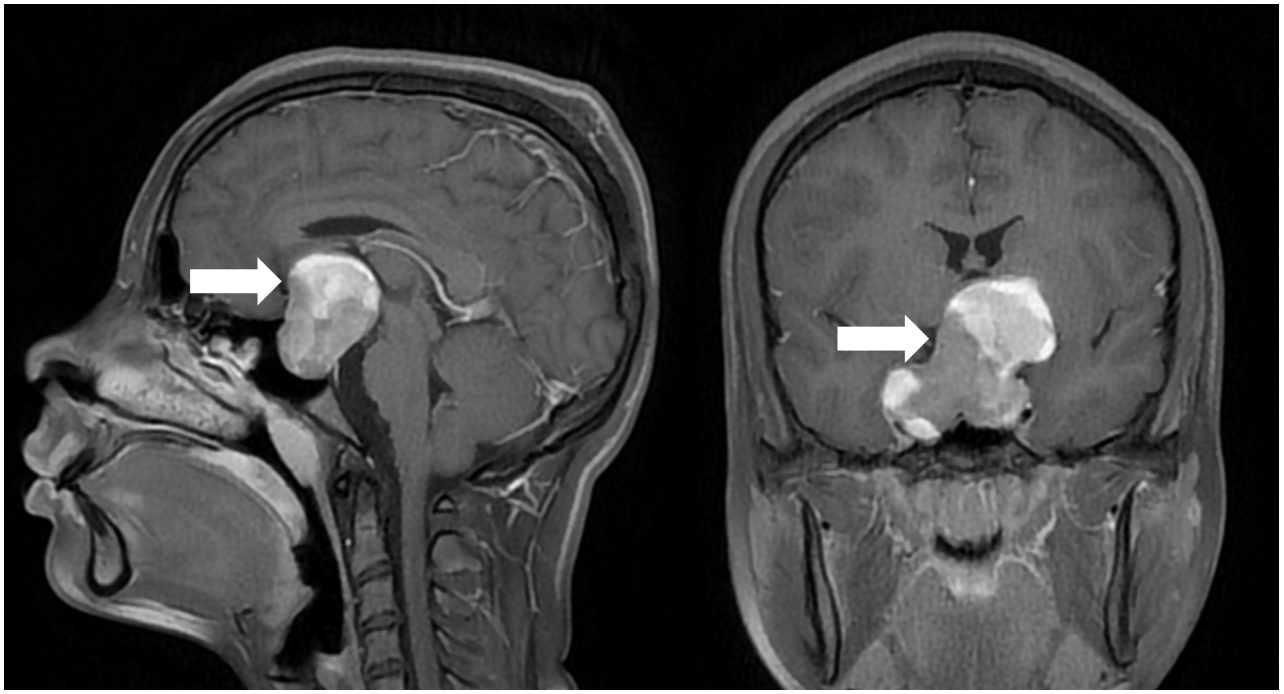

Figure 2. Preoperative MRI (29/01/24). A. Sagittal and B. coronal contrast-enhanced T1-weighted images demonstrating a large pituitary macroadenoma with significant suprasellar extension (arrows).

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magnesium 2.4 mg/dL, sodium 137 mmol/L, chloride 97 mmol/L, TSH 0.66 μIU/mL, total T3 0.49 ng/mL, T3 0.66 pg/mL, total T4 8.92 μg/dL, T4 0.91 ng/dL, and cortisol 0.71 μg/dL.

A pediatric endocrinology consultation was requested, and treatment was initiated with desmopressin 0.1 mg every 24 hours, levothyroxine 100 μg every 24 hours, prednisolone 3 mg daily, and cabergoline 0.125 mg weekly.

Clinical, biochemical, and imaging follow-up was continued. In April, IGF-1 levels were 750 ng/mL; in June, repeat testing showed 1050 ng/mL. Subsequent imaging in June 2024 (Figure 3) revealed a recurrent sellar lesion measuring 2.5 × 3 × 2.5 cm. Due to biochemical and radiological recurrence, a second surgical intervention via transsphenoidal approach was performed. The surgical intervention was performed using a standard endonasal transsphenoidal approach. Entry was achieved through one of the patient's nasal passages, progressing carefully through the nasal cavity to the sphenoid sinus. Following identification of anatomical landmarks, the sellar floor was exposed by drilling and removal of bone, thereby providing direct access to the pituitary fossa.

High-definition endoscopic visualization was employed throughout the procedure, offering magnified and angled views that facilitated precise dissection and minimized manipulation of adjacent structures. Tumor debulking and resection were carried out using microsurgical instruments, with particular attention to preserving normal pituitary tissue and protecting critical neurovascular structures, including the cavernous sinus and optic apparatus. Hemostasis was meticulously maintained, and intraoperative navigation confirmed the adequacy of tumor removal.

The extent of resection was estimated at ≥95%, with only minimal residual tissue suspected in areas closely adherent to vital structures (Figure 4). The patient tolerated the procedure without intraoperative complications, and immediate postoperative imaging corroborated the near-total resection.

Currently, follow up and hormonal supplementation are ongoing with levothyroxine, desmopressin, hydrocortisone and conjugated estrogens. Recent laboratory tests revealed decreased prolactin and growth hormone levels, being 4.05 ng/ml and 5.75 ng/ml, respectively (Figure 5).

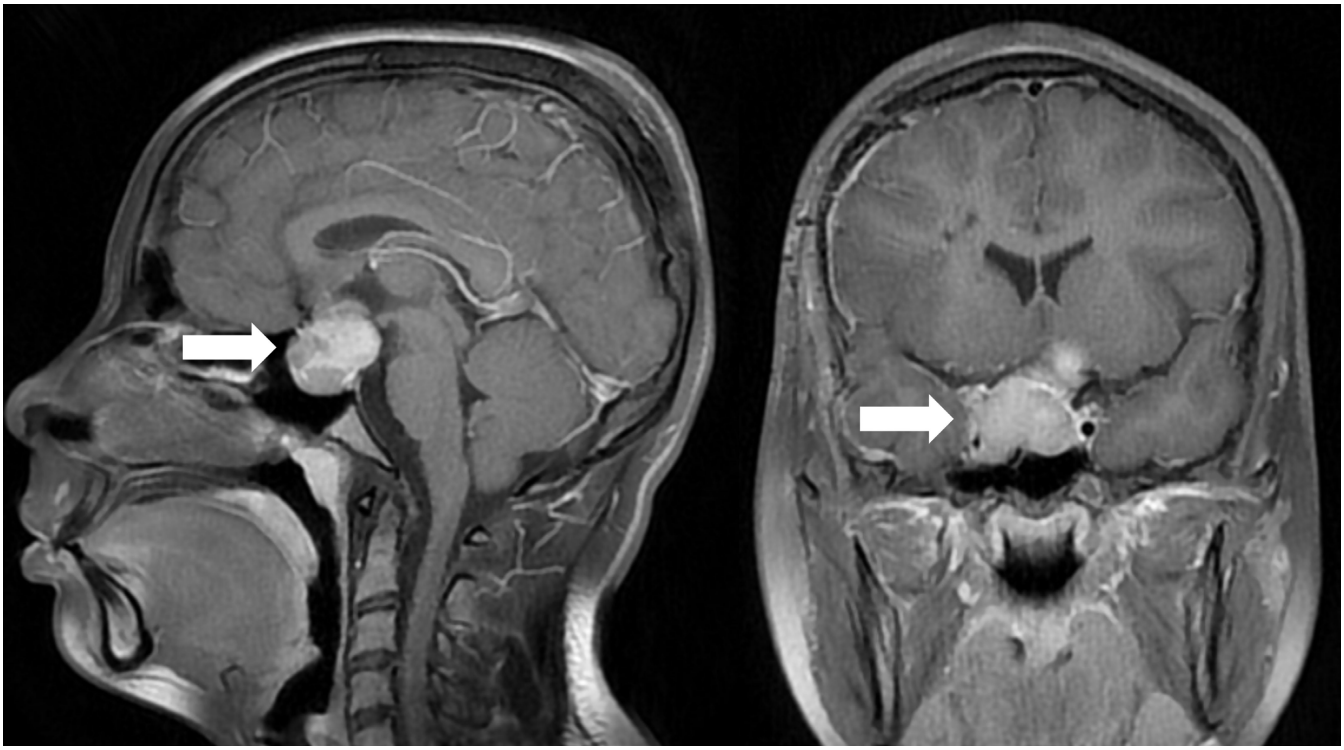

Figure 3. Postoperative MRI (First surgery – 22/06/24). A. Sagittal and B. coronal contrast-enhanced T1-weighted images demonstrating a residual pituitary tumor in the sellar and suprasellar regions (arrows) following the initial craniotomy.

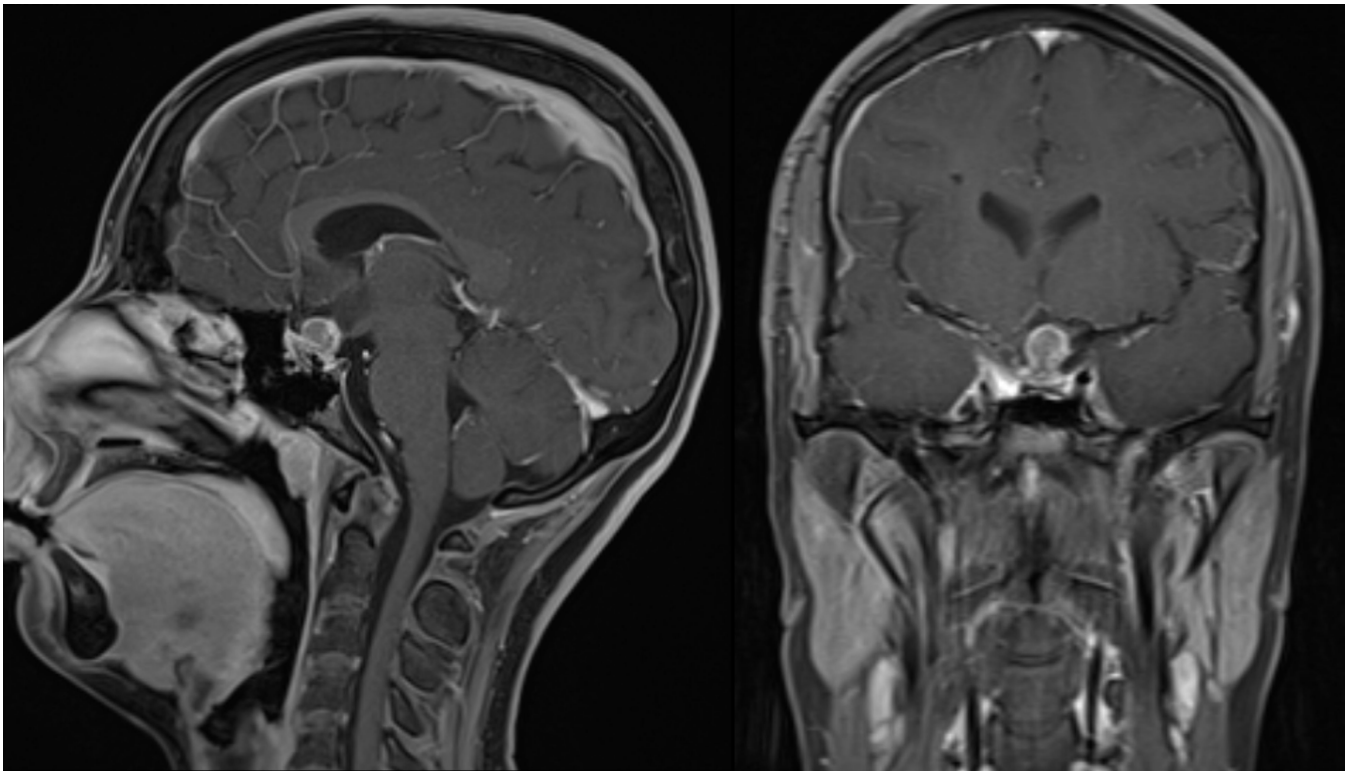

Figure 4. Postoperative MRI (Second Surgery – 04/08/25). A. Sagittal and B. coronal contrast-enhanced T1-weighted images showing the sellar region after the transsphenoidal approach, demonstrating successful tumor resection and decompression.

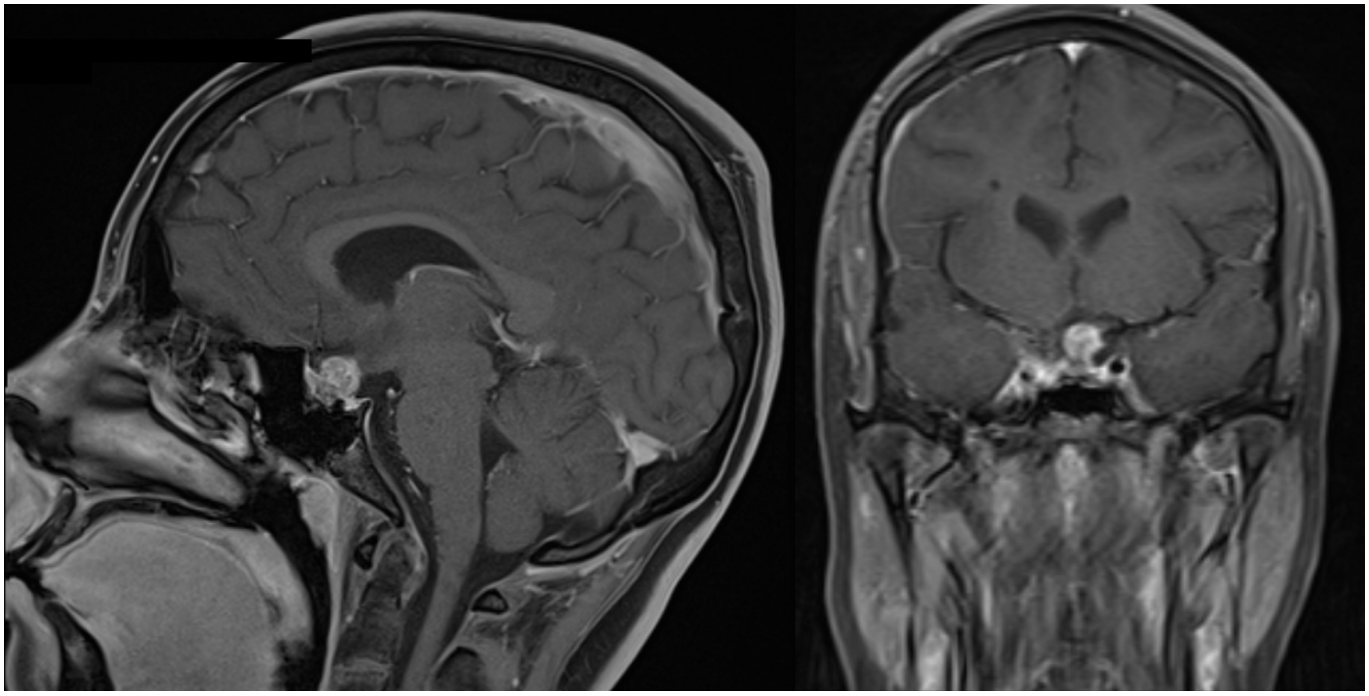

Figure 5. Long-term follow-up MRI (Long term follow-up – 12/02/26). A. Sagittal and B. coronal contrast-enhanced T1-weighted images demonstrating stable postoperative changes in the sellar region following the second surgery, with no evidence of tumor recurrence.

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3 DISCUSSION

Pituitary adenomas are rare neoplasms in children, accounting for only 2–6% of intracranial tumors. However, recent reports suggest an increasing incidence of pediatric adenomas, often presenting with more aggressive features, larger size, and earlier age of onset[7]. Depending on tumor functionality and size, the clinical presentation may range from compressive manifestations such as headache and visual disturbances[1,3] to syndromes secondary to hormonal hypersecretion, including galactorrhea, amenorrhea, gynecomastia, Cushing's syndrome, acromegaly or gigantism, tall stature, among others[8,9,10].

Approximately 90% of these tumors are functional, classified as pituitary neuroendocrine tumors (PiNETs)[2,7]. In a study published by Deng et al. in 2023, 232 pediatric PiNETs were analyzed, revealing predominance of ACTH secretion (38%), prolactin (27%), and growth hormone (17%)[3]. In the present case, the patient exhibited hypersecretion of both growth hormone and prolactin, leading to clinical features of gigantism and hyperprolactinemia. Pediatric adenomas present different clinical peculiarities compared to adults, as they tend to be more aggressive, and larger hypopituitarism is commonly found[11]; also, delayed puberty, short stature and weight gain are described, contrary to adults which tend to develop compressive features[12].

Prolactinomas are typically characterized by amenorrhea, galactorrhea, gynecomastia, and menstrual disturbances[10]. Therapeutic management depends on a combination of clinical, biochemical, and imaging criteria. For prolactinomas, dopamine agonists are the treatment of choice, achieving normalization of prolactin levels in nearly 100% of cases and tumor size reduction in approximately 90%[2]. Conversely, for growth hormone–secreting macroadenomas, surgery remains the preferred treatment due to the systemic complications they produce, including diabetes mellitus, systemic arterial hypertension, and sleep apnea[2].

Several surgical approaches are available, including open transcranial, microscopic transsphenoidal, and endoscopic endonasal techniques[13]. A comparative study published in 2012 evaluated these approaches in terms of resection capacity, complications, and recurrence rates. Open transcranial surgery achieved complete resection in 9.6% and subtotal resection in 90.4% of cases, with 17.5% free of complications, while 9.1% developed secondary diabetes insipidus, 9.1% hypopituitarism, 7.1% cerebrospinal fluid (CSF) leak, and 6.1% cerebral infarction[1,13]. Microscopic transsphenoidal surgery achieved total resection in 30.9% and subtotal in 50.3%, with 70% of patients free of complications; 8.7% developed diabetes insipidus, 9.5% hypopituitarism, and 5.1% CSF leak[1]. Endoscopic endonasal surgery demonstrated superior resection rates, with 47.2% total and 52.8% subtotal resections, and fewer complications, including diabetes insipidus (4.7%), sinusitis (3.2%), pulmonary embolism (2.1%), and hemorrhage (2.1%)[1,13]. Recurrence rates were reported as 30% for open transcranial, 20% for microscopic transsphenoidal, and 2.1% for endoscopic endonasal approaches[1,14].

In the present case, the patient underwent two surgical procedures. The first, via open transcranial approach, was followed by recurrence, consistent with literature reports. A second surgery was subsequently performed through an endoscopic endonasal approach, achieving ≥95% tumor mass resection.

4 CONCLUSIONS

This case highlights the clinical complexity and therapeutic challenges of pediatric pituitary adenomas, particularly those with dual hormonal hypersecretion. Although rare, these tumors may present with aggressive behavior, significant systemic manifestations, and high recurrence rates. The patient described required two surgical interventions—an initial open transcranial approach followed by an endoscopic endonasal resection—to achieve near-total removal of the tumor.

The case underscores the importance of early recognition, comprehensive hormonal and imaging evaluation, and a multidisciplinary management strategy involving neurosurgery, endocrinology, and radiology. Endoscopic endonasal surgery demonstrated superior outcomes in terms of tumor resection and reduced recurrence, consistent with current literature. Ultimately, vigilant long-term follow-up is essential to monitor for biochemical and radiological recurrence, optimize endocrine function, and improve quality of life in pediatric patients with pituitary adenomas.

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Ethics Committee Approval: *The present research corresponds to a clinical case report, a modality that in academic and scientific practice does not require approval from an Ethics Committee, provided that informed consent is obtained. No experimental interventions or procedures outside of standard medical care were performed; therefore, no additional risks were generated for the patient.* As the patient is under the legal age of consent, informed consent was duly signed by her parents, who, acting as her legal representatives, authorized the use of her clinical information for academic and publication purposes. *For this reason, submission to an Ethics Committee was not considered necessary, in accordance with international and national regulations which establish that clinical case reports require only the documentation of informed consent.*

Informed consent*: The patient's legal representatives provided written informed consent for all diagnostic and therapeutic interventions, and authorized the publication of this scientific article.*

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