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IP International Journal of Medical Paediatrics and Oncology

Journal homepage: https://www.ijmpo.com/

Case Report

Pituitary microadenoma with hyperprolactinemia in an adolescent female with type 1 diabetes mellitus and secondary amenorrhea: A rare case report

Hardik Shah[1]*, Naiya Bhavsar[2], Rajeshri Mehta[1], Ashok Bhandari[1], Akshat Desai[1]

[1]Dept. of Peadiatrics, DR. M.K. Shah Medical College, S.M.S Hospital, Ahmedabad, Gujarat, India
[2]Dept. of Pulmonary Medicine, DR. M.K. Shah Medical College, S.M.S Hospital, Ahmedabad, Gujarat, India

Abstract

Pituitary microadenomas are rare in adolescents and even more uncommon in those with Type 1 Diabetes Mellitus (T1DM). Hyperprolactinemia secondary to prolactin-secreting pituitary adenomas (prolactinomas) can disrupt the hypothalamic-pituitary-gonadal axis, leading to menstrual irregularities such as amenorrhea. The coexistence of T1DM and prolactinoma is exceptionally rare and poses diagnostic and therapeutic challenges.

We report the case of a 17-year-old female with a known history of T1DM who presentedwith secondary amenorrhea and intermittent episodes of hypoglycemia. Laboratory evaluation revealed severe hyperprolactinemia (serum prolactin: 945 ng/mL) with normal thyroid and gonadotropin levels. Brain MRI confirmed a pituitary microadenoma. The patient was initiated on cabergoline, resulting in clinical improvement. This case underscores the complex interplay between pituitary dysfunction and glycemic control in adolescents with T1DM.

In adolescent females with T1DM presenting with menstrual disturbances or unexplained glycemic fluctuations, pituitary pathology—particularly prolactinoma—should be considered. Early identification and targeted treatment can improve both endocrine and metabolic outcomes.

Keywords: Pituitary microadenoma, Hyperprolactinemia, Amenorrhea, Type 1 diabetes mellitus, Adolescents.

Received: 22-05-2025; **Accepted:** 30-06-2025; **Available Online**: 10-07-2025

1. Introduction

The pituitary gland, known as the "master gland," plays a central role in regulating endocrine function through its diverse hormone output, impacting organs such as the thyroid, adrenal glands, and gonads. However, it does not exert direct hormonal control over the pancreas's endocrine function. Still, indirect influences of pituitary hormones on glucose metabolism may lead to hypoglycemia or hyperglycemia in some scenarios.[1-4]

Amenorrhea associated with pituitary adenomas occurs in approximately 54 per 100,000 cases.[5] Prolactinomas, among the more common forms of pituitary tumors, may present with diverse symptoms such as headaches, visual field defects, or menstrual irregularities.[6-8] The co-occurrence of pituitary adenoma and type 1 diabetes mellitus (T1DM) in adolescents is extremely uncommon. Here, we present a rare case of a 17-year-old female with T1DM, secondary amenorrhea, and a pituitary microadenoma associated with severe hyperprolactinemia.

2. Case Presentation

A 17-year-old adolescent female, previously diagnosed with Type 1 Diabetes Mellitus (T1DM), presented to the pediatric ward with complaints of loose motions and vomiting for two days. On evaluation, she exhibited signs of diabetic ketoacidosis (DKA), with a significantly elevated HbA1c level of 14% and a random blood sugar (RBS) of 353 mg/dL (**Table 2**). She was managed in the Pediatric Intensive Care Unit (PICU) and transitioned to a subcutaneous insulin regimen.

Over the following months, the patient reported recurrent episodes of giddiness and generalized weakness. On one occasion, she was admitted for hypoglycemia. Insulin adjustments were made accordingly. She also developed

*Corresponding author: Hardik Shah
Email: hardik.ashah99@gmail.com

https://doi.org/10.18231/j.ijmpo.2025.012

secondary amenorrhea over the last 8 months. She had attained menarche at age 14 and had regular cycles until the amenorrhea began.

On her current admission, routine laboratory investigations were conducted (**Table 1**). Hemoglobin was 12.3 g/dL, WBC count was elevated at 15,900 cells/cumm, while her platelet count, urine microscopy, and differential counts were within normal limits. Notably, her RBS was 116 mg/dL and HbA1c had improved to 5.1%, reflecting good glycemic control under the revised insulin regimen.

Given the amenorrhea in a known diabetic patient, a hormonal evaluation was pursued (**Table 3**). A markedly elevated serum prolactin level of 945 ng/mL was noted (reference: 2.8–29 ng/mL), suggestive of hyperprolactinemia. Other hormonal parameters, including TSH, free T4, FSH, LH, and growth hormone, were within normal limits. However, her C-peptide level was significantly reduced (0.12 ng/mL), consistent with endogenous insulin deficiency**.**

Table 1: Routine laboratory workup on admission

Laboratory Assessment	Patient's Value	Normal Range
Hemoglobin	12.3 g/dL	12–15 g/dL
Total WBC Count	15,900 cells/cumm	4,000–11,000 cells/cumm
Differential WBC Count	Within normal range	–
Platelet Count	3,20,000 cells/cumm	1.5–4.5 lacs/cumm
Urine Routine Microscopy	Within normal range	-
Random Blood Sugar (RBS)	116 mg/dL	70–140 mg/dL
HbA1c	5.1 %	4–6 %

Table 2: HbA1c and RBS levels over time

Assessment Date	HbA1c	Random Blood Sugar (RBS)
Feb 2020	14%	353 mg/dL
April 2022	4.7%	84 mg/dL

Table 3: Hormonal assay results

Hormone	Patient's Value	Normal Reference Range
Prolactin	945 ng/mL	2.8–29 ng/mL
TSH	1.08 mIU/mL	0.48–4.17 mIU/mL
Free T4	1.41 ng/dL	0.83–1.43 ng/dL
FSH	7.6 mIU/mL	4.5–11 mIU/mL
LH	10.7–13.3 mIU/mL	1.7–13.3 mIU/mL
C-peptide	0.12 ng/mL	1.2–3.3 ng/mL
Growth Hormone	6.25 mcg/L	-

3. Discussion

Pituitary adenomas are benign tumors that originate from the anterior pituitary and account for approximately 10–15% of all intracranial tumors. These tumors can be functioning (hormone-secreting) or non-functioning, with prolactin-secreting adenomas (prolactinomas) being the most common subtype, particularly in young females. The estimated prevalence of clinically significant pituitary adenomas is 14–20 per 100,000 individuals, with prolactinomas representing nearly 40% of these cases.[9]

3.1. Hyperprolactinemia and menstrual dysfunction

Prolactin inhibits the hypothalamic-pituitary-gonadal (HPG) axis by decreasing the pulsatile secretion of gonadotropin-releasing hormone (GnRH) from the hypothalamus. This suppression leads to reduced secretion of LH and FSH from the anterior pituitary, impairing ovarian follicular development and ovulation. Clinically, this manifests as menstrual irregularities, ranging from oligomenorrhea to amenorrhea, and may also be accompanied by galactorrhea, infertility, or decreased libido.[10,11] In this patient, the presence of secondary amenorrhea and significantly elevated serum prolactin (945 ng/mL) raised suspicion for a prolactinoma, which was later confirmed via radiological imaging.

3.2. Pituitary dysfunction in type 1 diabetes mellitus

The co-occurrence of pituitary adenomas and T1DM is uncommon, and literature on this association is limited. T1DM results from autoimmune destruction of pancreatic β-cells, leading to absolute insulin deficiency. While the pituitary gland does not directly regulate insulin production, pituitary hormones—especially growth hormone (GH), ACTH (via cortisol), and TSH—significantly influence glucose metabolism. An imbalance in these hormones can affect insulin sensitivity and glucose homeostasis. For example, excess GH or cortisol can antagonize insulin action and precipitate hyperglycemia, while deficiencies may lower glucose thresholds and contribute to hypoglycemia.

In this case, the patient experienced recurrent hypoglycemia and a reduced need for insulin. These findings, particularly in the context of prior DKA and tight glycemic control (HbA1c 5.1%), raised the differential diagnosis of pituitary hormone deficiencies, such as ACTH or GH deficiency. However, hormonal assays ruled out other deficiencies, indicating that the primary pathology was isolated hyperprolactinemia. Nevertheless, the fluctuating glucose control may have been influenced by stress-related cortisol variations or changes in insulin sensitivity due to hormonal fluctuations associated with puberty, necessitating careful endocrinologic monitoring.

3.3. Diagnostic approach

The diagnostic workup for amenorrhea in adolescents involves a stepwise approach, starting with the exclusion of

pregnancy, followed by assessment of thyroid function, prolactin levels, and evaluation of gonadotropin axis integrity. In this patient, thyroid function tests were normal, and gonadotropin levels were within the pubertal range, ruling out primary ovarian insufficiency or central hypogonadotropic hypogonadism. The isolated hyperprolactinemia warranted neuroimaging, and a contrast-enhanced MRI of the brain revealed a pituitary microadenoma (<10 mm in size), consistent with a prolactinoma.

3.4. Management strategies

The primary treatment for prolactinomas is pharmacological therapy with dopamine agonists, such as cabergoline or bromocriptine, which effectively lower serum prolactin levels and reduce tumor size. Cabergoline is often preferred due to its longer half-life, better tolerability, and higher efficacy in normalizing prolactin and restoring menses. For our patient, starting cabergoline therapy led to clinical improvement, and follow-up hormonal monitoring was planned. Surgical intervention is generally reserved for cases that do not respond to medical therapy, or when there is significant tumor mass effect, such as visual field compromise.[12,13]

3.5. Implications for clinical practice

This case highlights the importance of considering pituitary pathology in young females with diabetes who present with unexplained hypoglycemia, menstrual abnormalities, or signs suggestive of hormonal imbalance. The diagnosis may be delayed if the symptoms are attributed solely to glycemic dysregulation, which is common in T1DM. Timely endocrine evaluation and neuroimaging are crucial for early diagnosis and intervention. Additionally, clinicians must remain vigilant about overlapping symptoms between diabetic control and pituitary dysfunction—such as fatigue, weight changes, or mood disturbances—that could mask underlying endocrinopathies.

3.6. Psychosocial considerations

Beyond physiological consequences, both T1DM and pituitary disorders can significantly impact adolescent psychosocial health, particularly in relation to body image, reproductive concerns, and treatment adherence. Multidisciplinary care involving endocrinologists, gynecologists, nutritionists, and mental health professionals is essential to ensure comprehensive care.

4. Conclusion

This case illustrates an unusual presentation of pituitary microadenoma in an adolescent with T1DM. Clinicians should be vigilant about atypical presentations of pituitary disorders, especially in young females with diabetes experiencing hypoglycemia and menstrual abnormalities. Early diagnosis and management can significantly improve both endocrine and metabolic outcomes.

5. Disclosures

1. Human subjects: Consent was obtained or waived from all participants.
2. Conflicts of interest: None declared.
3. Financial support: No financial support was received from any organization for this study.
4. Financial relationships: None declared by authors.
5. Other relationships: The authors declare no other relationships or potential conflicts of interest.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Cite this article: Shah H, Bhavsar N, Mehta R, Bhandari A, Desai A. Pituitary microadenoma with hyperprolactinemia in an adolescent female with type 1 diabetes mellitus and secondary amenorrhea: A rare case report. *IP Int J Med Paediatr Oncol*. 2025;11(2):52-54.