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Resolution of Bilateral Ovarian Theca Lutein Cysts Following Resection of a Functioning Gonadotroph Pituitary Macroadenoma: A Case Report

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Abstract

Functioning gonadotroph adenomas (FGAs) are rare pituitary neuroendocrine tumors (PitNETs) that secrete biologically active gonadotropins, which stimulate ovarian tissue and may result in ovarian theca lutein cysts in women. Because gonadotropin levels are often within normal reference ranges, diagnosis can be challenging and may lead to unnecessary gynecologic interventions. A woman with a recurrent gonadotroph PitNET underwent repeat tumor debulking. Approximately 60 days after surgery, she was found to have abnormal uterine bleeding (AUB), bilateral ovarian theca lutein cysts, and hyperestrogenemia. Pelvic ultrasonography revealed marked bilateral ovarian enlargement with multiple cystic lesions, measuring up to 10.4 cm on the right and 11.7 cm on the left. Laboratory evaluation revealed markedly elevated estradiol levels (496 pg/mL; normal range, 10-300 pg/mL), with an inappropriately normal follicle-stimulating hormone (FSH) level (5.2 mIU/mL; normal range, 3-10 mIU/mL) and suppressed luteinizing hormone level (0.3 mIU/mL; normal range, 2-12 mIU/mL). These findings raised suspicion for an FGA. Subsequent follow-up demonstrated a decline in estradiol levels and near-complete resolution of the ovarian cysts, with a marked reduction in ovarian size to 4.5 cm on the right and 4.6 cm on the left. This case highlights the importance of considering a FGA in women presenting with bilateral ovarian theca lutein cysts, hyperestrogenemia, endometrial thickening, and AUB. Although the clinical and biochemical findings suggest an association between the pituitary tumor and ovarian hyperstimulation, definitive causality cannot be established because the ovarian abnormalities were first documented after tumor debulking. Recognition of this rare entity may help guide appropriate management and avoid unnecessary ovarian intervention.

Categories: Obstetrics/Gynecology, Neurosurgery, Endocrinology/Diabetes/Metabolism
Keywords: abnormal uterine bleeding, functioning gonadotroph adenoma, gonadotroph pituitary neuroendocrine tumor (pitnet), hyperestrogenemia, ovarian theca lutein cysts

Introduction

Gonadotroph pituitary neuroendocrine tumors (PitNETs) are among the most common pituitary adenoma subtypes; however, most are clinically nonfunctioning. Functioning gonadotroph adenomas (FGAs) are rare and secrete biologically active gonadotropins, most commonly FSH, leading to ovarian hyperstimulation. Excessive FSH stimulation promotes ovarian follicular development, resulting in elevated estradiol levels and bilateral ovarian cyst formation. Under normal physiological conditions, elevated estradiol suppresses FSH secretion through negative feedback. Therefore, FSH levels within the laboratory reference range may be considered inappropriately normal in the setting of marked hyperestrogenemia, suggesting autonomous gonadotropin secretion. Clinical manifestations include menstrual irregularities, infertility, and bilateral ovarian enlargement with theca lutein cysts [1-4]. Diagnosis is often challenging because gonadotropin levels may appear normal despite significant ovarian hyperstimulation. Recognition of this rare condition is important, as identifying the underlying endocrine abnormality may help avoid unnecessary ovarian surgery. Here, we report a case of a functioning gonadotroph PitNET associated with bilateral large ovarian theca lutein cysts that regressed following treatment of the pituitary tumor.

Case Presentation

A 34-year-old G1P1 woman initially presented with blurred vision, bitemporal hemianopsia, hyperprolactinemia (191 ng/mL; normal range: 4.8-23.3 ng/mL), central hypothyroidism, and adrenal insufficiency. Hormonal evaluation revealed an FSH level of 9.62 mIU/mL (normal range: 3-10 mIU/mL) and a suppressed luteinizing hormone (LH) level of less than 0.12 mIU/mL (normal range: 2-12 mIU/mL). Magnetic resonance imaging (MRI) demonstrated a pituitary macroadenoma, and she underwent endoscopic endonasal transsphenoidal resection. Histopathological examination confirmed a gonadotroph PitNET. Postoperative MRI revealed residual tumor within the right cavernous sinus.

Approximately 15 months after the initial surgery, an MRI demonstrated progressive enlargement of the

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residual tumor, with the cavernous sinus component measuring 3.0 × 2.6 × 2.6 cm and the suprasellar component measuring 3.0 × 2.4 × 2.4 cm. The lesion invaded the right cavernous sinus and Meckel's cave and compressed the optic chiasm, resulting in worsening visual field deficits. Given radiographic progression and symptom recurrence, the patient underwent repeat tumor debulking via a right supraorbital craniotomy (Day 1). Histopathological analysis again confirmed a gonadotroph PitNET, with positive SF-1 and GATA3 immunostaining and a low Ki-67 proliferation index (3-4%). Adjuvant radiotherapy was planned for the residual tumor encasing the internal carotid artery.

Approximately on day 60 after repeat tumor debulking, the patient was referred for gynecologic evaluation due to abnormal uterine bleeding. Pelvic ultrasound demonstrated markedly enlarged bilateral ovarian multilocular lesions. The right ovary measured 10.4 × 8.4 × 9.5 cm (volume 431.6 cm^3), and the left ovary measured 11.7 × 9.4 × 6.4 cm (volume 368.2 cm^3) (Table *1*, Figures *1*, *2*). Both ovaries contained smooth multilocular lesions with anechoic internal echoes, no solid components, and no detectable vascularity. Subjective assessment by a gynecologic ultrasound expert was consistent with bilateral ovarian theca lutein cysts. The endometrium was also thickened. Concurrent laboratory testing revealed markedly elevated estradiol levels (496 pg/mL; normal range: 10-300 pg/mL) with inappropriately normal FSH levels (5.2 mIU/mL; normal range: 3-10 mIU/mL) and suppressed LH (0.3 mIU/mlL; normal range:2-12 mIU/mL) (Table *2*). Given the degree of estradiol elevation, the absence of physiologic FSH suppression raised concern for a functioning gonadotroph PitNET.

Finding	Right Ovary	Left Ovary
Dimensions	104 × 84 × 95 mm	117 × 94 × 64 mm
Volume	431.6 cm^3	368.2 cm^3
Morphology	Bilateral theca lutein cysts	Bilateral theca lutein cysts
Internal echoes	Anechoic	Anechoic
Color score	1	1

TABLE 1: Ultrasound findings on day 60 after pituitary surgery

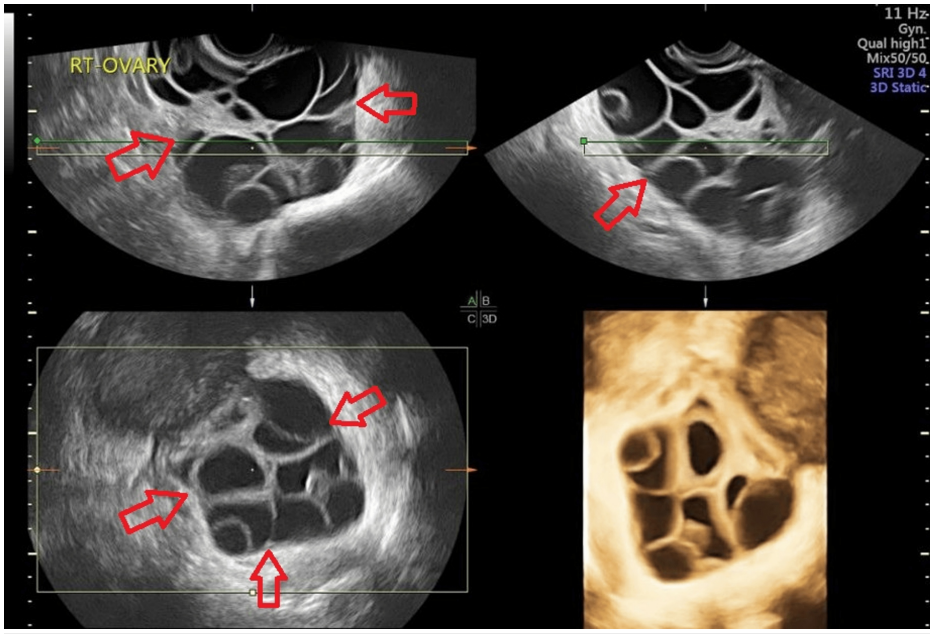


FIGURE 1: Three-dimensional transvaginal ultrasound of the right ovary showing marked ovarian enlargement (104 × 84 × 95 mm), with a smooth-walled, multilocular cystic appearance characterized by multiple anechoic, fluid-filled locules.

These findings are consistent with ovarian hyperstimulation. The red arrow indicates the enlarged right ovary. The left ovary, not shown, demonstrated similar enlargement and multilocular cystic morphology.

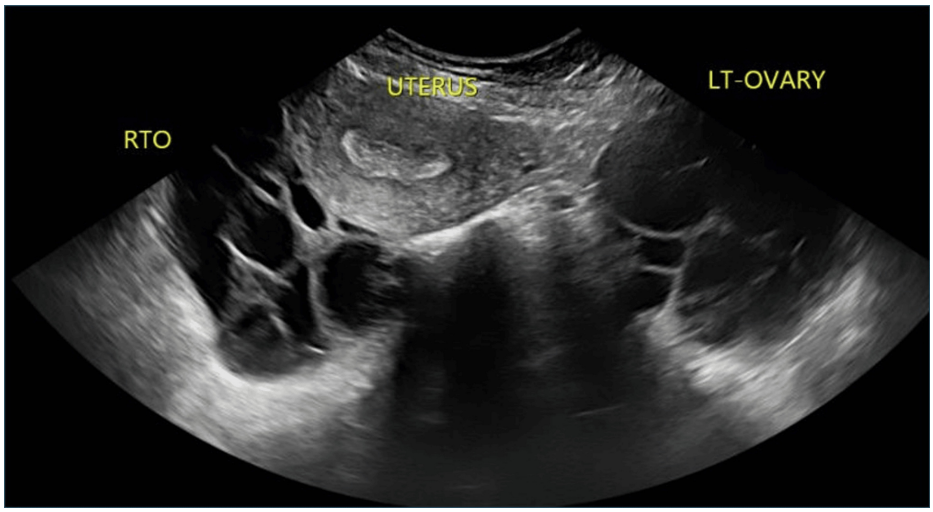


FIGURE 2: Transverse transabdominal ultrasound demonstrates marked bilateral ovarian enlargement with a multilocular appearance, characterized by multiple cystic structures of varying sizes.

Both ovaries are visualized on either side of the uterus, consistent with ovarian hyperstimulation.

Date	FSH (3-10 mIU/mL)	LH (2-12 mIU/mL)	Estradiol (10-300 pg/mL)	Prolactin (4.8-23.3 ng/mL)
Day 60 after debulking surgery	5.2	0.3	496	67.4
Day 75 after debulking surgery	5.8	0.2	91	53.7

TABLE 2: Changes in hormone levels following pituitary surgery

At a subsequent follow-up on day 75, estradiol had decreased to 91 pg/mL (normal range: 10-300 pg/mL), while FSH remained 5.8 mIU/mL (normal range: 3-10 mIU/mL) and LH remained suppressed at 0.2 mIU/mL (normal range:2-12 mIU/mL) (Table *2*). On day 150 after repeat tumor debulking, repeat pelvic ultrasound demonstrated near-complete resolution of the bilateral ovarian cysts, with normalization of ovarian size and morphology. The right ovary measured 4.5 × 3.5 × 2.7 cm (volume 22.2 cm^3), and the left ovary measured 3.9 × 3.4 × 4.6 cm (volume 32.6 cm^3) (Table *3*, Figure *3*). The parallel decline in estradiol levels and regression of the ovarian cysts supported a hormonally mediated process related to the gonadotroph PitNET. The patient continued to experience abnormal uterine bleeding characterized by intermenstrual bleeding (metrorrhagia).

Finding	Right Ovary	Left Ovary
Dimensions	45 × 35 × 27 mm	39 × 34 × 46 mm
Volume	22.2 cm^3	32.6 cm^3
Morphology	Normal premenopausal ovary	Normal premenopausal ovary
Multiloculated cysts	Absent	Absent

TABLE 3: Ultrasound findings on day 150 after pituitary surgery

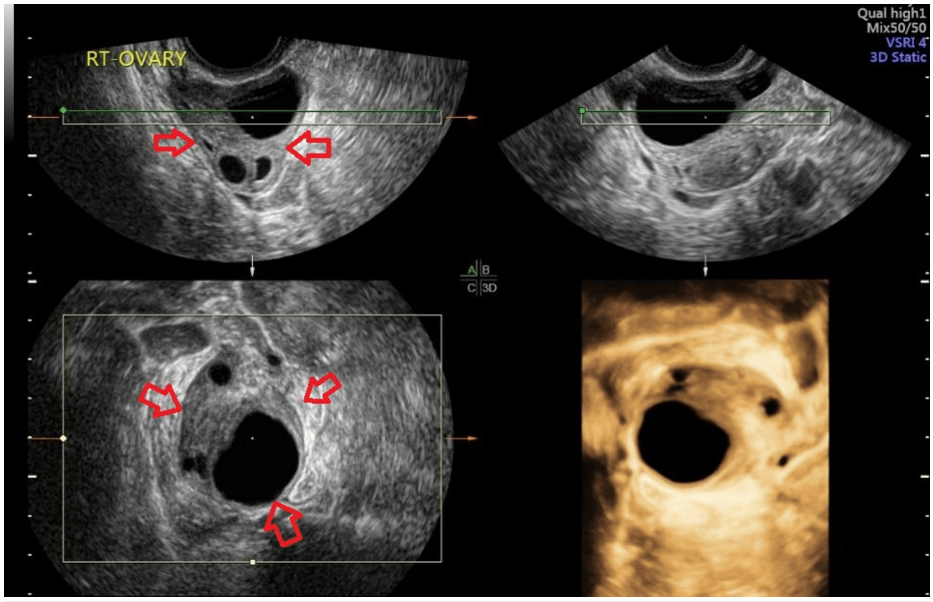


FIGURE 3: Three-dimensional transvaginal ultrasound of the right ovary following estradiol decline demonstrates a marked reduction in ovarian size (45 × 35 × 27 mm), with restoration of normal ovarian morphology, resolution of the previously enlarged cystic structures, and visualization of a dominant follicle and several small follicles.

Red arrows indicate the right ovary.

Despite the decline in estradiol levels and substantial reduction in ovarian size, the endometrium remained thickened (Figure *4*). The patient subsequently underwent hysteroscopy with dilation and curettage, which revealed a polypoid endometrium (Figure *5*). Histopathologic examination of the endometrial curettage demonstrated fragments of a benign endometrial polyp in the background of proliferative endometrium, with additional sampling showing proliferative endometrium. CD68 and pancytokeratin immunohistochemical staining supported the diagnosis (Figure *6*).

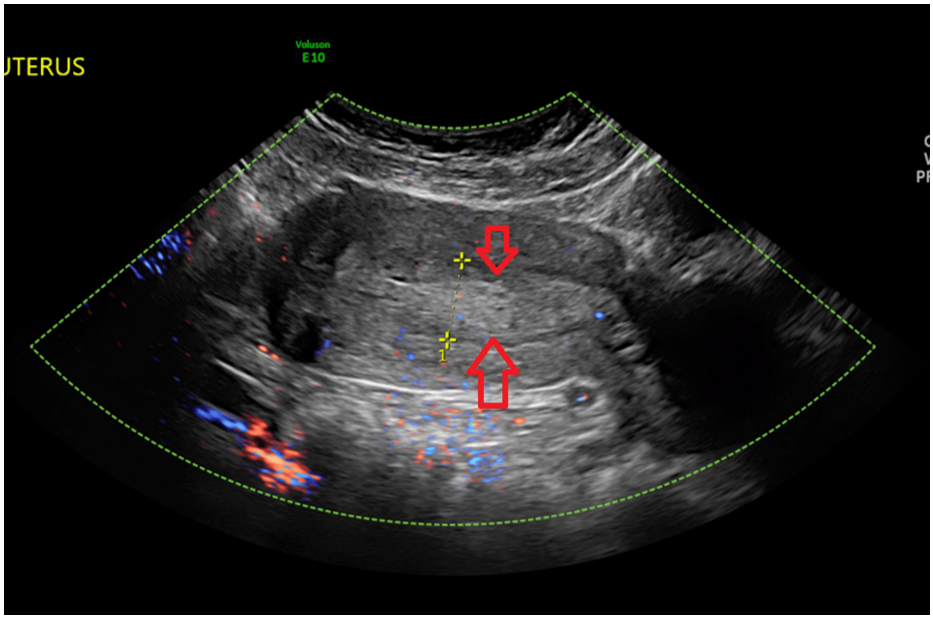


FIGURE 4: Ultrasound demonstrating persistent endometrial thickening (red arrow)

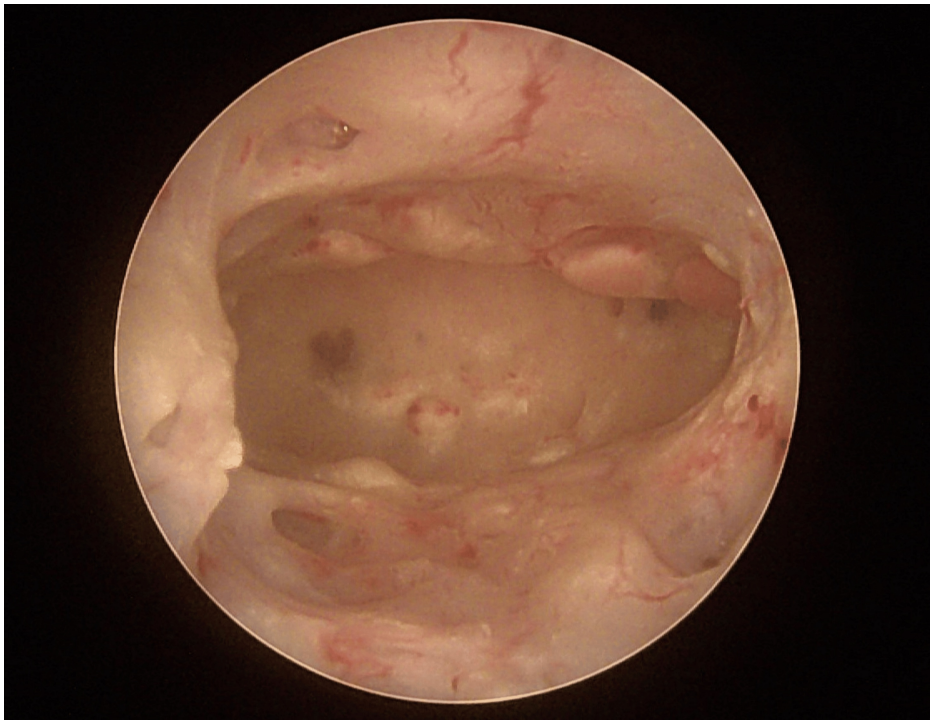


FIGURE 5: Hysteroscopic appearance of the endometrium.

Hysteroscopy revealed a polypoid endometrium characterized by irregular, polyp-like projections of the endometrial tissue into the uterine cavity.

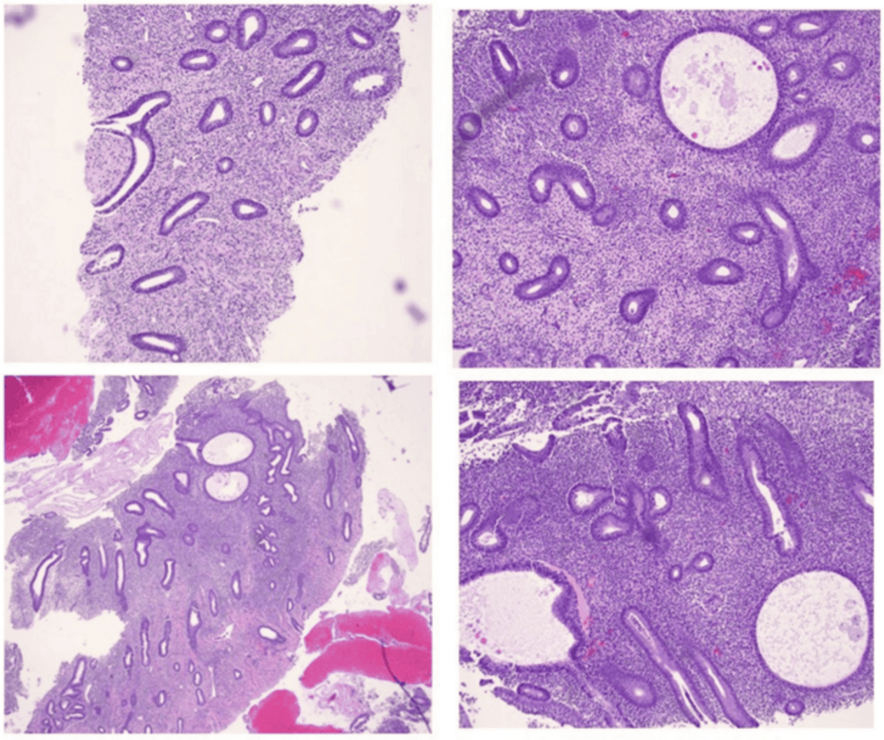


FIGURE 6: Histopathologic examination reveals a benign endometrial polyp with a background of proliferative endometrium and no evidence of malignancy.

The proliferative endometrial pattern was consistent with estrogenic stimulation in the setting of elevated estradiol levels, while the endometrial polyp may have contributed to the patient's intermenstrual bleeding.

The patient continued to experience right-sided peripheral visual field deficits and blurred vision following tumor debulking, although gradual improvement was noted. Approximately 150 days after surgery, adjuvant radiotherapy was initiated for the residual tumor. A planned total dose of 53.2 Gy was delivered in 28 fractions. She completed radiotherapy and tolerated treatment well without acute complications.

Discussion

Gonadotroph PitNETs are among the most common pituitary adenoma subtypes; however, the vast majority are clinically nonfunctioning and present with symptoms related to mass effect rather than hormone hypersecretion. FGAs are exceedingly rare, accounting for less than 1% of pituitary adenomas, and are characterized by secretion of biologically active gonadotropins capable of stimulating ovarian follicular development and estradiol production [1-2]. Women with FGAs typically present with menstrual disturbances, infertility, ovarian hyperstimulation syndrome-like manifestations, and bilateral ovarian theca lutein cysts [3,5]. The biochemical hallmark is elevated estradiol associated with an inappropriately normal or mildly elevated FSH level. Because gonadotropin concentrations often remain within the normal reference range, the diagnosis may be overlooked [2,4].

In our patient, who presented with AUB characterized by intermenstrual bleeding, bilateral ovarian theca lutein cysts, markedly elevated estradiol levels (496 pg/mL; normal range: 10-300 pg/mL), suppressed LH concentrations (0.3 mIU/mL; normal range: 2-12 mIU/mL), and an inappropriately normal FSH level (5.2 mIU/mL; normal range: 3-10 mIU/mL), raised suspicion for a functioning gonadotroph PitNET. Despite marked hyperestrogenemia, FSH was not appropriately suppressed, suggesting biologically active gonadotropin secretion. Pregnancy was excluded by a negative pregnancy test. The ovarian abnormalities were first documented approximately 60 days after repeat tumor debulking, and preoperative gonadotropin measurements and pelvic imaging were unavailable, limiting the ability to establish a definitive causal relationship. Nevertheless, the subsequent decline in estradiol levels and near-complete regression of the ovarian cysts, with ovarian volumes decreasing from 431.6 cm^3 to 22.2 cm^3 on the right and from 368.2 cm^3 to 32.6 cm^3 on the left, support a possible hormonally mediated association with the gonadotroph PitNET. Importantly, ovarian improvement occurred before the initiation of radiotherapy, suggesting that the observed regression was not attributable to radiation treatment. Although these findings are consistent with a functioning gonadotroph PitNET, the absence of preoperative hormonal and pelvic imaging data prevents

definitive confirmation of causality.

Similar findings have been reported in previous cases of FGAs, presenting with ovarian hyperstimulation syndrome, large bilateral ovarian cysts, and theca lutein cysts [3-8]. Recognition of this rare entity is important, as treatment of the underlying pituitary tumor may lead to regression of ovarian lesions and help avoid unnecessary ovarian surgery when clinical and imaging findings are reassuring and appropriate surveillance is feasible. In our patient, the known pituitary tumor, characteristic hormonal profile, and imaging findings supported the diagnosis of ovarian hyperstimulation associated with a functioning gonadotroph PitNET. The subsequent decline in estradiol levels and regression of the ovarian cysts further supported this association. However, because the ovarian cysts were first identified after tumor debulking and preoperative pelvic imaging was unavailable, a definitive causal relationship between the pituitary tumor and ovarian abnormalities cannot be established.

Conclusions

This case highlights a rare presentation of a functioning gonadotroph PitNET associated with bilateral ovarian theca lutein cysts and hyperestrogenemia. The combination of markedly elevated estradiol levels and inappropriately normal FSH concentrations should prompt consideration of pituitary-mediated ovarian hyperstimulation. Although the clinical and biochemical findings suggest an association, a definitive causal relationship cannot be established, as the ovarian cysts were first documented after pituitary surgery. Recognition of this rare entity may help avoid unnecessary ovarian surgery when clinical and imaging findings are reassuring and appropriate surveillance is feasible. A multidisciplinary approach involving endocrinology, neurosurgery, expert gynecologic imaging, and gynecology is essential for accurate diagnosis and optimal management.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Sonia Eskandarion, Emad Mikhail

Acquisition, analysis, or interpretation of data: Sonia Eskandarion, Cari Eckman, Lauri Hochberg

Drafting of the manuscript: Sonia Eskandarion

Critical review of the manuscript for important intellectual content: Cari Eckman, Lauri Hochberg, Emad Mikhail

Supervision: Emad Mikhail

Disclosures

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