



A Rare Case of Uterine Torsion With Juvenile Granulosa Cell Tumor in the Pediatric Patient

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Juvenile granulosa cell tumors of the ovary are rare sex cord-stromal ovarian tumors that are typically diagnosed during the first 2 decades of life. Most patients present with precocious puberty in the early stages of disease. We present a rare case of asymptomatic uterine torsion from a 15-cm juvenile granulosa cell tumors in a 5-year-old girl with elevated inhibin B, breast development, vaginal bleeding, and a palpable right-sided abdominal mass. *UROLOGY* 128: 87–89, 2019. © 2019 Elsevier Inc.

CLINICAL CASE

A 5-year-old Caucasian girl presented with a 3-month history of breast development, 2 episodes of mild cyclical vaginal bleeding that lasted 3 days separated by 30 days and increased abdominal girth. On examination, she was found to have a non-tender palpable mass in the right lower quadrant, Tanner stage II breast development, and clear vaginal discharge.

A pelvic ultrasound showed a well-circumscribed right adnexal mass containing both solid and cystic components, measuring $13.9 \times 7.7 \times 11.2$ cm. The right ovary was not identified during the ultrasound evaluation. The left ovary was normal in size and location and had normal Doppler flow. The uterus demonstrated pubertal configuration, with a large fundus and a thickened endometrial stripe of 3 mm (0–2 mm).¹

Due to concern for an ovarian tumor, a computed tomography (CT) scan of the chest, abdomen, and pelvis with intravenous contrast was performed (Fig. 1a). The CT scan confirmed a complex abdominopelvic mass measuring $14.5 \times 10.3 \times 6.8$ cm, containing both cystic and solid components and arising from the right adnexa. In addition, there was mild right hydronephrosis, suspected to be secondary to compression of the ureter by the large tumor. The CT scan showed no lymphadenopathy or potential metastases.

Endocrine work-up revealed low levels of luteinizing hormone (LH) and follicle stimulating hormone (FSH) and markedly elevated estradiol concentration at 104 pg/mL (normal <16 pg/mL), which explains the patient's isosexual

precocious puberty. Serum inhibin B was elevated at 1300 pg/mL (normal <27 pg/mL), suggesting an inhibin secreting tumor of the ovary.² In addition, tumor markers alpha-fetoprotein, human chorionic gonadotropin, lactate dehydrogenase, carcinoembryonic antigen, and carbohydrate antigen 19-9 were within normal limits. Given the elevated serum inhibin B and estrogen levels, the leading diagnosis was juvenile granulosa cell tumor (JGCT) of the right ovary.

The patient underwent an exploratory laparotomy via a midline incision. Straw-colored peritoneal fluid was encountered and sent for cytology immediately upon entering the abdomen and prior to manipulating the tumor. The uterus was found to be rotated 180 degrees on its sagittal axis. The adnexal mass was in the right hemipelvis but actually involving the left ovary. Left oophorectomy and salpingectomy were performed to remove the ovarian mass in its entirety (Fig. 2). There were no palpable lymph nodes, but a left-sided pelvic lymphadenectomy was performed and included all nodes extending from the common iliac to the internal iliac. Frozen sections were not performed.

Pathology revealed JGCT of the left ovary with negative surgical margins. Gross specimen revealed a firm, rubbery mass with solid and cystic components. Microscopic pathology demonstrated neoplastic juvenile granulosa cells with high mitotic rate, atypical mitoses, pleomorphism, and rare Call-Exner bodies (Fig. 3). The neoplastic cells were strongly inhibin-positive and demonstrated a high Ki-67 rate at 40%. The lymph node packet yielded 1 reactive node without evidence of malignancy. Peritoneal fluid cytology was normal. Final pathology was consistent with International Federation of Gynecology and Obstetrics (FIGO) stage IA (pT1a, N0, M0).

The postoperative course was uneventful, and the patient was discharged on postoperative day 2. After discussion at our multidisciplinary Tumor Board, the decision was made to have her follow-up for physical examination and serum markers every month and CT scans of the

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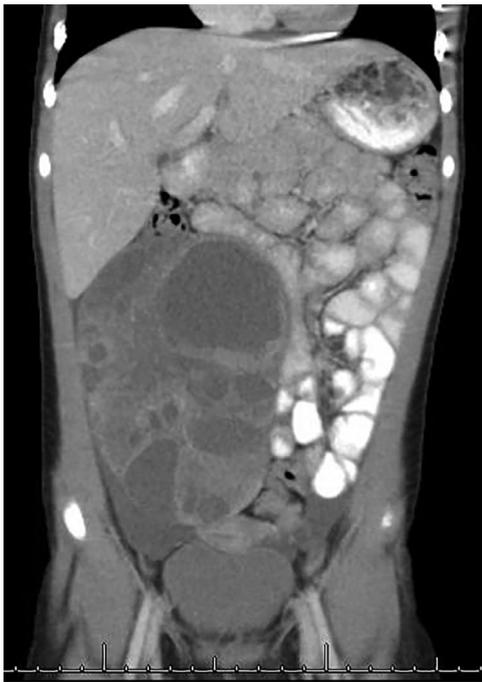


Figure 1. Coronal view of abdominal and pelvic CT scan. Well-circumscribed, intra-abdominal mass (14.5 × 10.3 × 6.8 cm) with solid and cystic components, appearing to originate from the right adnexal region.

abdomen and pelvis with intravenous contrast in a month and then every 3 months for the first year. Breast development regressed significantly within 1 month. The right hydronephrosis had also resolved by 1 month. Serum inhibin and estradiol were undetectable at 2 months

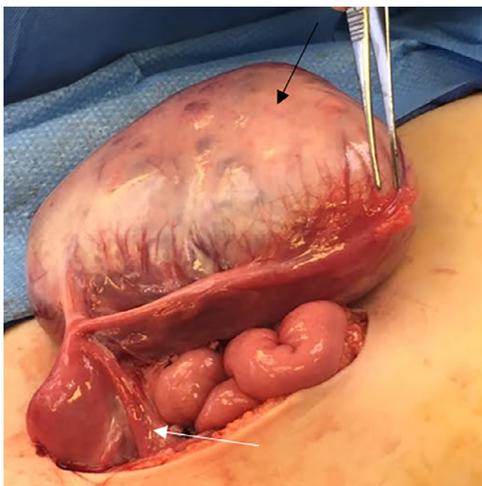


Figure 2. Exploratory laparotomy revealed a left adnexal mass (15 cm in length) occupying the right side of the pelvis with associated uterine torsion. Uterus and right adnexa appeared normal. Black arrow: ovarian tumor. White arrow: uterine torsion at level of isthmus with the left broad and round ligaments pulled to the right. A limited left sided pelvic node dissection was performed, but no palpable lymph nodes were identified.

postoperatively. At 36 months of follow-up, the patient had no evidence of disease recurrence.

DISCUSSION

JGCT are rare sex cord-stromal tumors of the ovary. Approximately 40% of patients with JGCT present during the first decade of life. However, JGCT has been found in patients ranging from infants to postmenopausal women.³⁻⁵

Presentation of JGCT can vary depending on the age of the patient. Premenarcheal girls typically present with iso-sexual precocious puberty, characterized by development of secondary sexual characteristics, vaginal bleeding, breast enlargement, and advanced bone age due to increased serum estradiol. Peripubertal or postpubertal girls generally present with abnormal uterine bleeding and intermittent abdominal pain. Ten percent of patients present with an acute abdomen due to tumor hemorrhage or ovarian torsion. Tumors between 5 and 10 cm have the highest risk of ovarian torsion.^{3,5-8}

Interestingly, our patient was found to have uterine torsion precipitated by the large size of her ovarian tumor. There are reported cases of uterine torsion in adult women with adnexal masses, but they are more commonly reported with pregnancy or associated with fibroids.⁹ In the pediatric population, uterine torsion is exceedingly rare and can result in irreversible uterine ischemia if torted > 60 degrees. The torsion occurs at the level of the uterine isthmus and presents as intermittent pelvic pain. The few cases had associated complex utero-adnexal structural abnormalities.^{10,11} Our patient was asymptomatic and had no evidence of uterine injury or narrowing at the isthmus. Removal of the left ovarian tumor allowed the uterus to return to its natural lie.

JGCT should be included in the differential diagnosis when a patient presents with the classic endocrine abnormalities and imaging findings suggestive of an ovarian mass. Radiographically, JGCT appears nonspecific as a multiloculated adnexal mass with cystic and solid components. Elevated inhibin B is pathognomonic, but pathology at time of resection is confirmatory.

Initial management of JGCT involves surgical resection. While we chose an open approach for this 15 cm tumor, Till and Schmidt successfully resected a 6 cm JGCT from a 6-year-old female laparoscopically.¹² More broadly, Shim et al. described 28 patients of all ages who underwent uncomplicated laparoscopic surgery for malignant nonepithelial ovarian tumors. Fourteen of them had primary granulosa tumors ranging 3.3-11.3 cm in size.¹³ Regarding lymph nodes, a retrospective study of 308 patients with stage I sex-cord stromal tumors of the ovary found no difference in survival with lymphadenectomy.¹⁴ In a review by Kleppe et al., 86 of a total 578 patients underwent lymphadenectomy for sex-cord stromal tumors of the ovary; none of the 86 patients had positive lymph nodes.¹⁵ While data on other sex-cord stromal tumors suggests that lymphadenectomy is not necessary, there is no literature pertaining to JGCT.

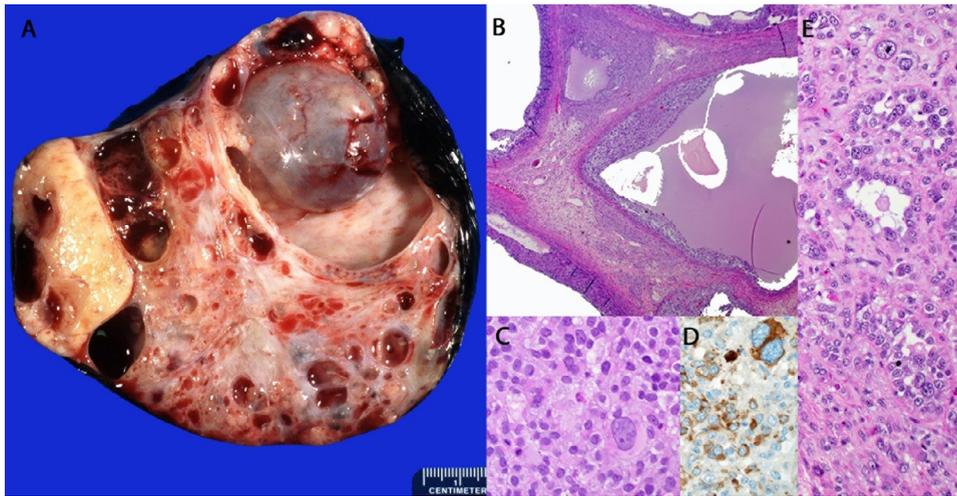


Figure 3. Juvenile granulosa cell tumor. (A) Unfixed cut section of ovarian mass (587 g, 14 × 11 × 6 cm) with solid and cystic components devoid of heterologous components. (B) Cystic component composed of dilated follicles lined by neoplastic granulosa cells with luminal secretions (magnification 40×). (C) Follicular lining shows variable bland appearing juvenile granulosa cells without distinct nuclear grooves and pale to eosinophilic (luteinized) cytoplasm with variable cellular pleomorphism, including macronuclei (magnification 400×). (D) Majority of cells are highlighted by inhibin immunostaining (magnification 400×). (E) Solid areas show variable pleomorphism with hyperchromatic nuclei and distinct nucleoli with variable small follicular type spaces (magnification 400×).

The prognosis of patients with JGCT is favorable, with only rare instances of late recurrences. The periodic measurement of serum inhibin may help to determine risk of recurrence as its expression is restricted to ovarian granulosa cells in women. Ninety percent of JGCT are FIGO stage I; however, 10% of the cases can present at advanced stages with malignant features and thus require chemotherapy.^{3,4,16} Despite the large size of the tumor, our patient presented with a favorable pathology at FIGO stage I, so surveillance was appropriate for follow-up.

CONCLUSION

We report the first pediatric case of asymptomatic uterine torsion from a large ovarian JGCT. JGCT is a rare pediatric tumor that presents with precocious puberty due elevated serum inhibin B and estradiol, and has a relatively favorable prognosis when diagnosed early and resected completely. Our patient had a 15 cm adnexal mass that had caused asymptomatic uterine torsion and the classic signs of precocious puberty.

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