Malignant Childhood Ovarian Cancer: A Ten-Year Retrospective Review

Bretton Laboret, BS; Claire Bonnyman, MD; Joseph T. Murphy, MD

Division of Pediatric Surgery, University of Texas Southwestern Medical Center; Children's Health Children's Medical Center

BACKGROUND

- Although pediatric ovarian cancer is rare (2.6/100,000 females per year), upwards of 10-20% of identified masses are malignant [1,2].
- There are three categories of primary ovarian neoplasms: surface epithelial, germ cell, and sex-cord stromal tumors [1,2].
- Germ cell tumors (GCTs) are the most common type in pediatrics, accounting for two-thirds of all ovarian tumors [2].
- The clinical presentation for benign and malignant ovarian pathology often overlaps, and there is minimal consensus regarding imaging and other pre-operative diagnostic modalities.
- Pediatric ovarian malignancies are surgically excised with a focus on fertility preservation. Patient survival has increased over the past several decades due to advancements in diagnosis and adjunct chemotherapy [3].
- This study aims to 1) confirm the incidence and type of ovarian malignant and borderline neoplasms at Children's Medical Center from 2009 to 2019, and 2) describe the clinical presentation, preoperative workup, and treatment methods of these patients to ascertain predictive preoperative indicators of malignancy.

METHODS

An IRB approved retrospective review of 49 children (<19 years old) who underwent surgery at our institution for malignant or borderline tumors between January 2009 and January 2019 was conducted. Data collected includes:

- Chief complaint
- Age at operation
- Presentation
- Tumor marker levels
- Imaging modality
- Tumor size/characteristics
- Surgical approach
- FIGO staging
- Presence of torsion
- Treatment adjuncts
- Postoperative follow-up

TABLE 1. SAMPLE DESCRIPTION

	Total	GCTs	STs	ETs/Other	Borderline
	n=49	n=27	n=13	n=2	n=7
Mean Age (SD)	13 (3.9)	12.2 (4.2)	12.3 (4.2)	17 (0.0)	15.7 (3.3)
Presentation					
ED	32 (65)	18 (67)	7 (54)	2 (100)	5 (71)
Referral	17 (35)	9 (33)	6 (46)	-	2 (29)
Chief Complaint					
Pain	22 (45)	12 (44)	4 (31)	1 (50)	5 (71)
Distension	21 (43)	12 (44)	6 (46)	1 (50)	2 (29)
Irregular Menses/Other	5 (10)	3 (11)	2 (15)	-	-
Incidental	1 (2)	-	1 (8)	-	-

* GCT (germ cell tumor), ST (stromal tumor), ET (epithelial tumor). Data reported as n(%) in tables 1 and 2.

FIGURE 1. TUMOR DISTRIBUTION

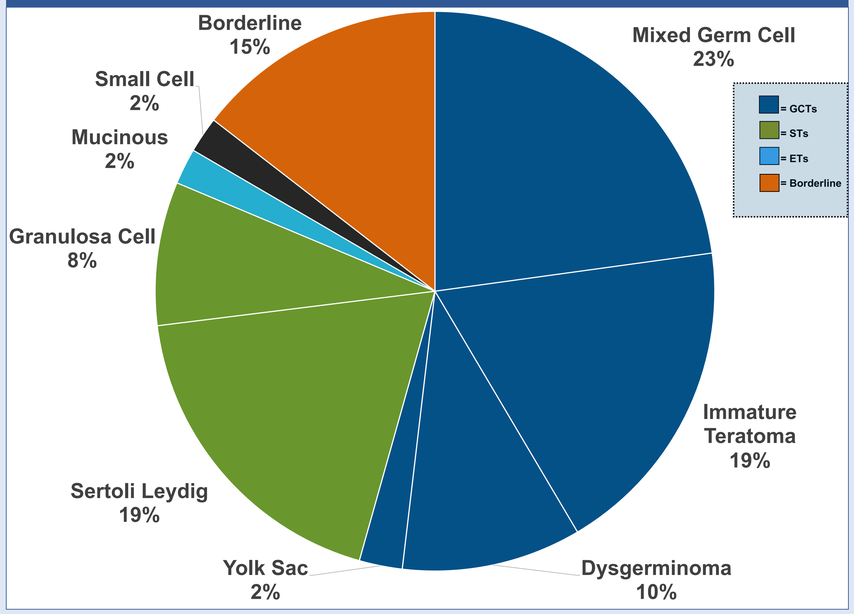
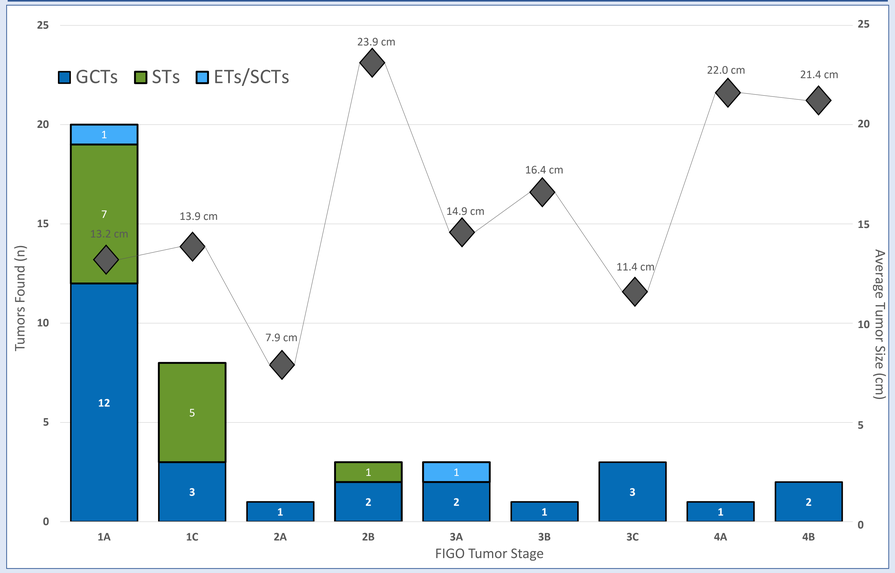


TABLE 2. TUMOR EXAMINATION

	Total	Germ Cell	Stromal	Epithelial/ Small Cell	Borderline
Lab Markers (elevated/ordered)					
a-FP (0.0-15 ng/ml)	23/48 (48)	17/27 (63)	6/13 (46)	0/2 (0)	0/6 (0)
b-hCG (0.0-2.3 IU/L)	18/45 (40)	16/24 (67)	2/13 (15)	0/2 (0)	0/6 (0)
CA-125 (0-35 unit/ml)	15/24 (63)	6/14 (43)	4/9 (44)	1/1 (100)	4/5 (80)
LDH (141-681 unit/L)	16/29 (55)	12/17 (71)	4/8 (50)	0/2 (0)	0/2 (0)
Imaging Modality					
CT	34 (69)	17 (63)	10 (77)	2 (100)	5 (71)
Ultrasound (US)	27 (55)	18 (67)	4 (31)	2 (100)	3 (43)
MRI	6 (12)	4 (15)	2 (15)	--	--
Laterality					
Right	28 (57)	15 (56)	7 (54)	2 (100)	1 (14)
Left	21 (43)	11 (41)	4 (31)	--	6 (86)
Presence of Torsion					
No	40 (82)	22 (81)	11 (85)	2 (100)	5 (71)
Yes	9 (18)	5 (19)	2 (15)	--	2 (29)
Chemotherapy					
Yes	21 (50)	14 (52)	6 (46)	1 (50)	--

FIGURE 2. FIGO STAGING VS AVERAGE TUMOR SIZE



CONCLUSIONS

- Germ cell tumors (GCTs) represented most ovarian malignancies (64%), confirming prior studies. Epithelial tumors accounted for only 2.4% of tumors (vs. 5-20% in literature), while stromal tumors represented 31.0% of tumors (vs. 3-22% in literature).
- Most patients presented to the ED for evaluation (65%) with a primary complaint of abdominal pain or distention (>95%). Ovarian malignancy should be on the differential for a patient with this presentation.
- CT was the most utilized imaging modality, followed closely by ultrasound. Malignant tumors showed elevations in a-FP, b-hCG, LDH, and CA-125. No single marker alone was able to predict malignancy with accuracy, which is why we recommend a complete panel of serum tumor markers (a-FP, b-hCG, LDH, CA-125, and Inhibin A/B) for both preoperative evaluation and postoperative surveillance.
- Early differentiation between borderline and malignant neoplasms is important for prognosis. No significant difference in tumor size was found between groups (14.7 vs 14.6 cm; P=0.9626). However, there was a significant difference in age of presentation between patients with malignant and borderline tumors (12.5 vs 15.7; P=0.0234).
- There was no significant difference found between average tumor size and FIGO stage (P>0.05). Every patient underwent surgery with the intention of preserving fertility, and half of all malignancies were accompanied by adjuvant chemotherapy. There was a ninety-two percent survival rate in the patient population.
- Standardizing the workup of potentially malignant ovarian tumors is important to maximize patient outcomes. We recommend a standardized preoperative workup consisting of multi-modal imaging studies and a complete tumor marker panel for all patients presenting with suspicion for an ovarian tumor.

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