Immature Cystic Teratoma with Contralateral Mature Cystic Teratoma in a Pediatric Patient: Operative and Ethical Considerations to Management

Nemia L. Privado, MD and Zedrix I. Gallito, MD, FPOGS, FPSRM, FPSGE
Department of Obstetrics and Gynecology, Mary Johnston Hospital

Immature cystic teratoma (IMCT) is a rare ovarian malignancy, usually presenting as a huge unilateral pelvoabdominal mass in the pediatric age. Even rarer is the occurrence of a concomitant contralateral mature cystic teratoma. Management issues include use of fertility sparing versus complete surgical staging, and the use of chemotherapy. Fortunately, IMCT carries a good prognosis, especially when diagnosed early. Chemotherapy is used only in higher stage disease and recurrence.

Key words: immature cystic teratoma, mature cystic teratoma, bilateral ovarian cysts

Introduction

An abdominal mass in a pediatric patient is a rare finding and one that warrants investigation to rule out a malignant process. Symptoms would vary including pain, fever, abdominal distention, changes in urinary and bowel habits, weight loss, hypertensive episodes, changes in menstrual cycle, or they could be asymptomatic.[1,2] A multidisciplinary approach with pertinent laboratory work-ups and adequate imaging is imperative in managing such patients.

Ovarian teratomas are the most common germ cell neoplasms, with different histologic subtypes. Mature cystic teratomas (MCT) are common benign cysts which contain mature elements from three germ layers: ectoderm (skin, brain), mesoderm (muscle, fat), and endoderm (epithelium). Immature cystic teratoma (IMCT), on the other hand, contains immature or embryonic tissues from all germ layers. IMCTs are less common than MCTs, are larger, and affect the younger age group.[3] Management entails choosing between fertility sparing surgery versus comprehensive surgical staging with chemotherapy, and each has its own advantages and drawbacks.[3,4,5,6]

This paper documents an rare condition involving a pediatric patient who presents with an IMCT in one ovary, and an MCT on the contralateral ovary. Operative and ethical considerations are also discussed.

The Case

The authors were presented with a 15-year old nulligravid, who came in with complaints of abdominal pain and an enlarging abdominal mass. Aside from vomiting, there were no other associated symptoms such as fever, weight loss or gain, changes in appetite, nor changes in bowel or bladder habits. She had no history of trauma, nor history of abnormal menses. No history of sexual contact or contraceptive use. She consulted at the Emergency Room, in pain, but ambulatory and with stable vital signs. Abdominal and rectal examination revealed a mass at the left lower quadrant, solid to cystic, slightly movable, tender on palpation. She was admitted for further investigation of the abdominal mass and eventually underwent surgery.

Investigations

Laboratory results revealed a negative pregnancy test, slightly elevated tumor markers (Table 1), and findings of a pelvoabdominal mass on whole abdominal CT scan and transrectal ultrasound (Table 2; Figure 1).

Table 1. Tumor markers and results obtained from patient revealed elevated values of CEA, Ca-125, and AFP.

		Normal Values	Patient Values	
CEA	ng/mL	Non-smokers: <5 Smokers: <10	11.59	Elevated
Ca-125	U/mL	0-35	38.781	Elevated
Serum bHCG	mIU/mL	10-100	2.01	Normal
LDH-L	U/L	0-243	177	Normal
AFP	ng/mL	0-20	20.6	Elevated
Ca 19-9	U/mL	<35	14.4	Normal

Table 2. Transrectal ultrasound with Doppler results revealed a huge pelvoabdominal mass suggestive of an ovarian new growth at the left, and a normal right ovary.

Uterus	3.7cm x 2.6cm x 2.8cm Anteverted
Endometrium	1.0 cm The endometrium is thickened, echogenic with intact linear, endometrial midline; endomyometrial junction is regular; no intracavitary fluid; no color flow (Score 1)
Cervix	3.2cm x 1.6cm x 1.9 cm
Right ovary	2.8cm x 2.1cm x 1.8 cm
Left ovary	There is a pelvoabdominal mass measuring 14.9cm x 11.6cm x 12.9 cm (vol 1,117 mL), thickened (0.8 cm), anechoic with echogenic solid area measuring 8.0xm x 7.0cm x 8.1 cm, with septations suggestive of Ovarian New Growth. Intratumoral color flow revealed with minimal color flow (score of 2)
Others	Minimal fluid in the cul-de-sac
Impression	Pelvoabdominal mass suggestive of ovarian new growth, left IOTA Adnex Model suggestive of 54.1% risk of malignancy and 45.7% chance of benign lesion Normal size anteverted uterus with thickened endometrium Normal right ovary

Differential Diagnosis

A painful abdominal mass can arise from the different organ systems within the abdominal cavity, and can either be benign or malignant. Additional symptoms would also vary, ranging from fever, hematuria, abdominal distention, hypertensive episodes, weight loss, constipation, elevated biomarkers, or they could also be asymptomatic.[2] Thus, a patient presenting with an abdominal mass should be seen by Pediatrics, Surgery, Gynecology, and Oncology services.

The Surgery department first saw the patient, with the initial impression of intraabdominal abscess. An abdominal abscess is defined as a collection of cellular debris, enzymes, and liquefied remains which can arise from an infectious or non-infectious source.[7] An abscess is not uncommon, and can develop almost anywhere in the abdomen. However, most are confined to some part of the peritoneal cavity, and may be walled off by the omentum, viscera, or mesentery. Causes range from perforation of abdominal organs due to infection or trauma, drug related, or as a post-operative complication. Evaluation of the mass requires a CT scan to reveal the location, size, presence of bowel thickening, and ileus. CT scan can also aid in aspiration of localized abscess.

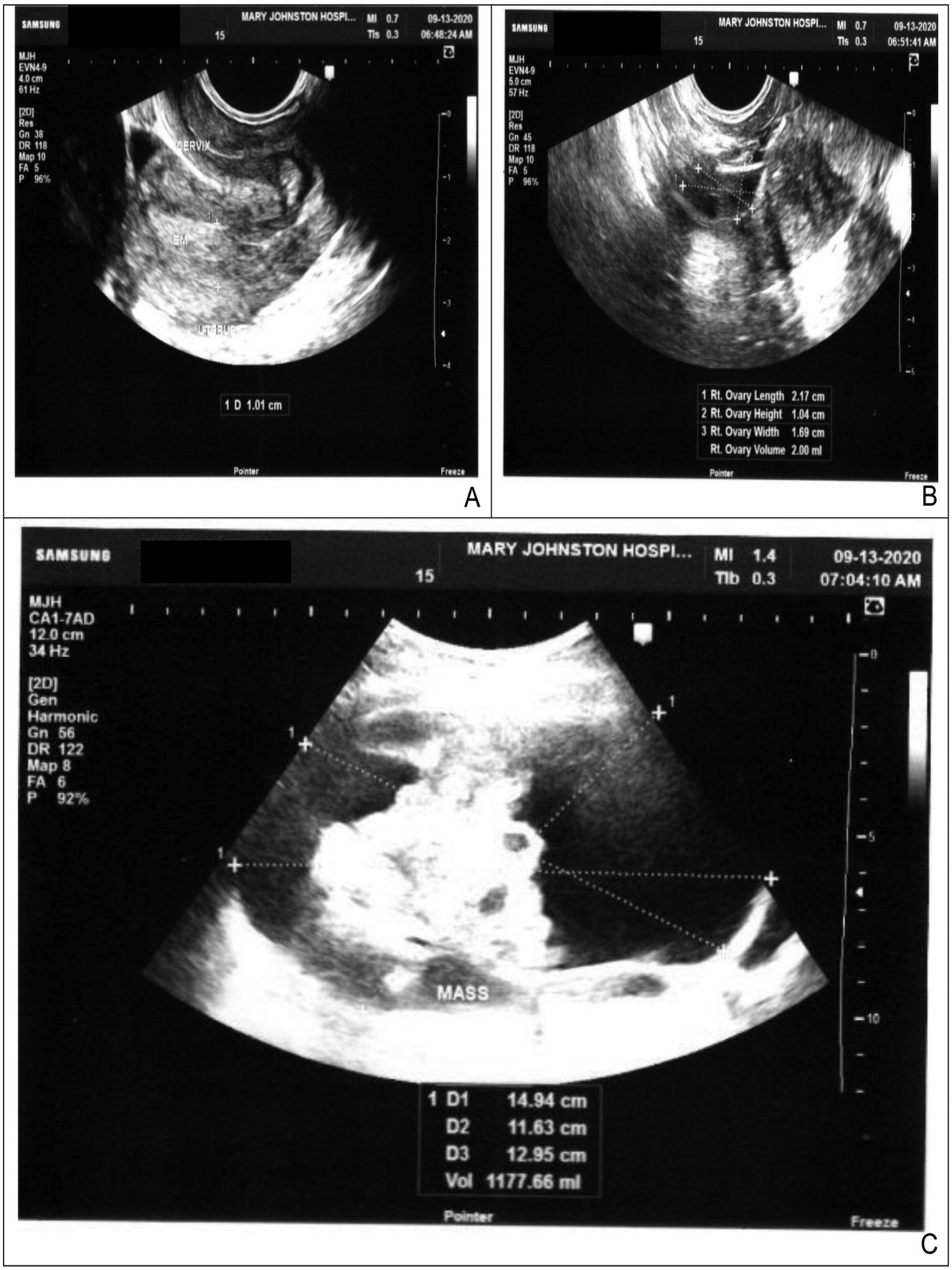

Figure 1. Transrectal ultrasound with Doppler studies reveal a normal sized anteverted uterus with thickened endometrium (1.0 cm) (A). The right ovary was visualized normal in size (B), and the left ovary was converted to a huge pelvoabdominal mass measuring 14.9cm x 11.6cm x 12.9cm, anechoic, with an echogenic solid area measuring 8.0cm x 7.0cm x 8.1cm, and minimal color flow (score of 2), suggestive of ovarian new growth (C).

Abdominal masses in children may originate from the kidney. Wilms tumor or nephroblastoma is the most common renal malignancy in childhood, while clear cell carcinoma is the second. For adolescents, renal cell carcinoma is the most common kidney tumor. These renal tumors may be asymptomatic, or may present with abdominal pain, and is mostly unilateral. However, these are ruled out because renal masses usually present with hematuria and other urinary symptoms, and also hypertension secondary to renin secreting tumors.[2]

Pregnancy should always be ruled out in any sexually active female of reproductive age, who presents with abdominal pain, or irregular vaginal bleeding. A positive pregnancy test should warrant further investigation for an intra- or extra-uterine pregnancy, whether viable or not.[1]

Lastly, a gynecologic pathology should be ruled out, be it ovarian, tubal or paratubal cysts, mullerian abnormalities, infectious etiology, or pregnancy-related as previously discussed. Adnexal masses requiring surgical intervention are not common in the pediatric population, with previous authors quoting 2.6 cases per 100,000 girls. Most adnexal masses are benign, while only 9-11% are malignant.[1] The presenting symptoms associated with an adnexal mass in pediatric patients vary, and include acute abdominal pain, mass effect, nausea, vomiting, and (less commonly) precocious puberty and vaginal bleeding. Aside from history taking and physical examination, the use of tumor marker and imaging can greatly aid in differentiating these adnexal masses.

Treatment

The patient was admitted for serial abdominal examination, and eventually planned for exploratory laparotomy, left salpingooophorectomy with frozen section, and surgical staging to include peritoneal fluid cytology, bilateral lymph node dissection, random peritoneal sampling, and infracolic omentectomy.

Intraoperative findings (Figure 2) revealed minimal ascites, with smooth peritoneal surfaces and no adhesions. The left ovary was pearly white in color, cystically and irregularly enlarged to approximately 14.5cm x 10.0cm x 9.0cm with a smooth intact capsule. The left fallopian tube was pinkish and stretched out, measuring 8.0cm x 0.5cm x 0.5cm. The fallopian tube and ovarian pedicle were twisted once. The left ovary was removed with intact capsule and sent for frozen section, revealing an Immature cystic teratoma. On cut section, the left ovarian cyst exuded seromucinous contents and multiple locules and nodules. There were also few hair strands, sebum, and an orbit.

The uterus was small, pinkish, and smooth. On the right ovary was a pearly-white ovarian cyst, measuring 3cm x 5cm x 3cm. It which was inadvertently ruptured intraoperatively, and spilled sebum and tufts of hair; the right fallopian tube was grossly normal. Right oophorocystectomy was done. On cut section, the right ovarin cyst consisted of an irregular, multinodular, brown-white, fluctuant to soft tissue fragment measuring 4.5cm x 3.1cm x 2.7cm. Sections disclosed loculated cysts measuring from 0.5 cm up to 2.5 cm in widest diameter. The cysts contained yellow, greasy material admixed with hair strands.

Histopathology results (Table 3; Figure 4) revealed an IMCT confined to the left ovary, and a MCT of the right ovary. The left ovary disclosed mostly mature tissue elements consisting of neural tissue, bone, skin, colonic mucosa, fats, smooth muscle, serous and mucinous glands, and cartilage. There were also immature neural tissue and cartilage amounting to not more than one low power objective per slide examined. Microsections of the right ovary disclosed cysts containing admixture of mature cartilage, fats, serous glands, neural tissue and fibrocollagenous tissue, along with cystic follicles and corpora albicantia. Lymph nodes sequestered showed no evidence of metastasis.

Outcome and Follow Up

Postoperative course of the patient was unremarkable, and the patient was discharged improved. Biopsy results were explained to the patient and her family. They were presented with the option to undergo chemotherapy or observation, and the family opted for observation. On follow up consultations, the patient had excellent wound healing, with return of regular menses. Repeat tumor markers were within normal values (Table 4).

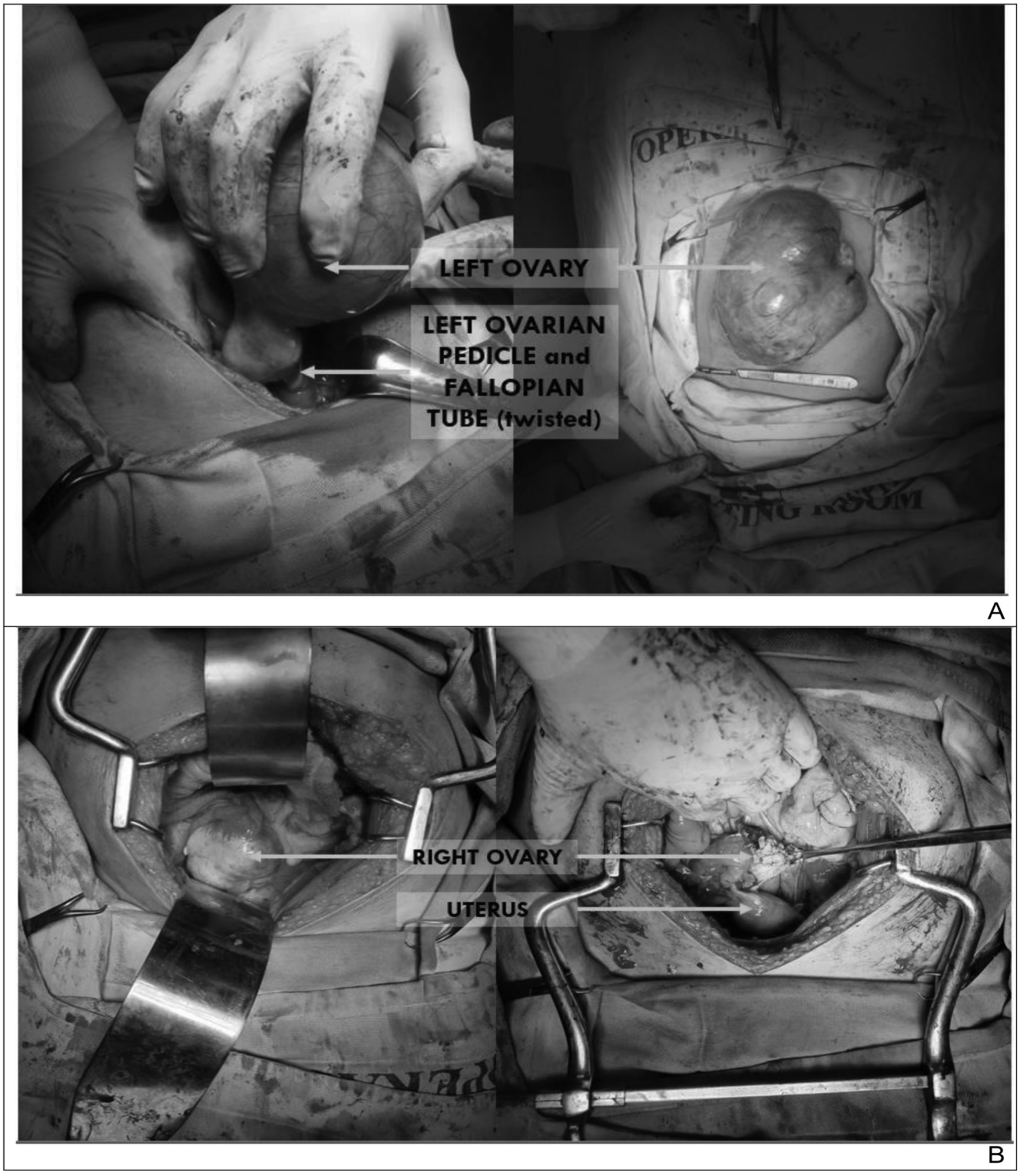

Figure 2. Intraoperative findings revealed that the left ovary was pearly white in color, cystically and irregularly enlarged to approximately 14.5cm x10.0cm x 9.0cm with a smooth intact capsule. The left fallopian tube was pinkish and stretched out, measuring 8.0cm x 0.5cm x 0.5cm. The fallopian tube and ovarian pedicle were twisted once (A). The uterus was small, pinkish, and smooth. There was an incidental finding of a cystically enlarged right ovary, measuring approximately 5cm x 7cm x 5cm. There is an ovarian cyst, pearly white in color, measuring 3cm x 5cm x 3cm, which was inadvertently ruptured intraoperatively containing sebum and tufts of hair; the right fallopian tube was grossly normal (B).

Table 3. Histopathology results revealed an Immature cystic teratoma confined to the left ovary, and a mature cystic teratoma of the right ovary.

Frozen section	
Left ovary	Teratoma with immature cartilage, consider Gr I Immature teratoma
Cytology report	
Peritoneal fluid	Chronic inflammatory pattern
Surgical pathology report	
Left ovary	Immature cystic teratoma (diameter: 11.5cm) (AFIP/WHO Gr. 1) (O'Connor Gr. 1)
Left fallopian tube	Unremarkable
Right ovarian cyst	Mature cystic teratoma
Paracolic gutter peritoneum	Fibroconnective tissue, fulgurated
Pelvic peritoneum	Hemorrhage Severe congestion
Right external iliac lymph node	Fatty tissue No lymphoid tissue seen
Left external iliac lymph node	Negative for metastasis, (0/4)
Left obturator lymph node	Focal hemorrhage Severe congestion No lymphoid tissue seen
Omentum	Fibrosis hemorrhage Severe congestion Acute inflammation

Table 4. Tumor markers and results obtained from the patient on follow up after five months revealed normal values.

		Normal Values	Patient Values (Preoperative)	Patient Values (Follow-up)
CEA	ng/mL	Non-smokers: <5 Smokers: <10	11.59	0-5
Ca-125	U/mL	0-35	38.781	0-35
Serum bHCG	mIU/mL	10-100	2.01	
LDH-L	U/L	0-243	177	166.25
AFP	ng/mL	0-20	20.6	1.3
Ca 19-9	U/mL	<35	14.4	

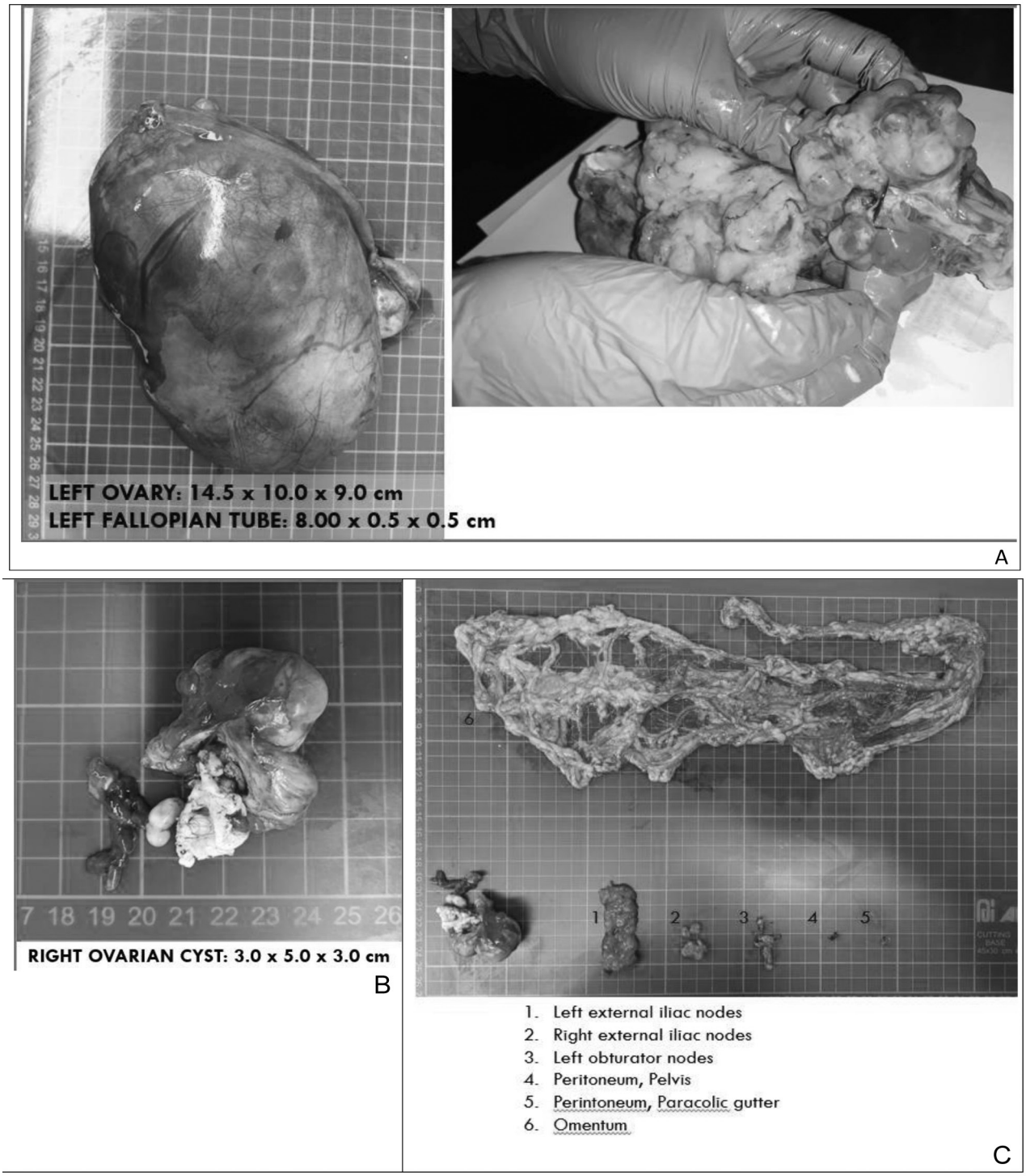

Figure 3. Grossly, the left ovary was cystically enlarged measuring 14.5cm x 16.0cm x 9.0 cm, with a left fallopian tube measuring 8.0 cm long with a 0.5 cm diameter. The left ovarian cyst was opened to reveal seromucinous contents and multiple locules measuring from 1.0cm x 1.0cm x 1.0 cm to 7.0cm x 5.0cm x 5.0 cm. Also present are cream white soft nodules measuring from 2.8cm x 2.0cm x 1.5cm to 3.2cm x 2.0cm x 2.0 cm. These nodules have a white pasty cut surface. Also seen are few hair strands, sebum, and an orbit (A). The right ovary consists of an irregular, multinodular, brown-white, fluctuant to soft tissue fragment measuring 4.5cm x 3.1cm x 2.7cm. Sections disclose loculated cysts measuring from 0.5 cm up to 2.5 cm in widest diameter. The cysts contain yellow, greasy material admixed with hair strands (B). Sequestered tissues for the lymph nodes only yielded four lymph nodes from the left external iliac area. The omentum consists of irregularly- shaped, fatty tissue fragment measuring 10.0cm x 8.5cm x 3.0cm, with no noted caking or solid areas (C).

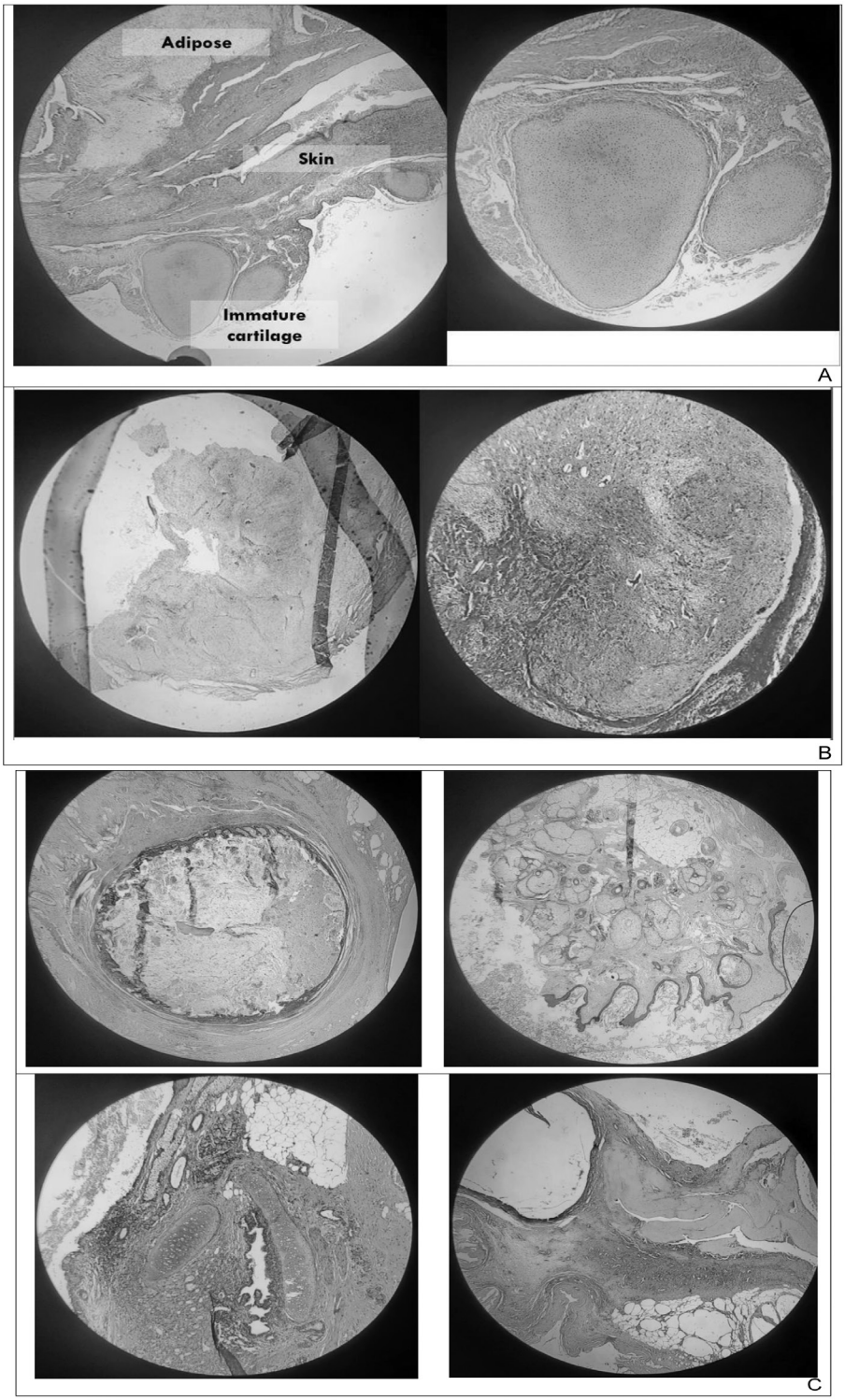

Figure 4. Microsections of the left ovary disclose mostly mature tissue elements consisting of neural tissue, bone, skin, colonic mucosa, fats, smooth muscle, serous and mucinous glands, and cartilage. Scattered cysts are variously lined by stratified squamous epithelium, mucinous columnar cells and ciliated pseudostratified columnar epithelium (A). Among these are tissue components with slight degree of immaturity consisting of neural tissue and cartilage amounting to not more than one low power objective per slide examined (B). Microsections of the right ovary disclose cysts variously lined by stratified squamous epithelium, ciliated pseudostratified columnar epithelium, and mucinous cells. Within the wall are random admixture of mature cartilage, fats, serous glands, neural tissue and fibrocollagenous tissue. Scattered cystic follicles and corpora albicantia are likewise present (C).

Discussion

Immature cystic teratoma is a rare subtype comprising less than 5% of all of ovarian neoplasms.[1] They are usually large cysts, unilateral than bilateral, occurring at peak age of 15-19 years of age.[3] Patients usually present with a palpable abdominal mass which may or may not be painful.[4] Histologically, IMCT is composed of immature tissues derived from the three germ layers. Grossly, it may be a solid mass sometimes with cystic component. These cystic areas are filled with serous or mucinous fluid, or sebaceous material.

In the Philippines, ovarian cancer is the third most common malignancy for female Filipinos, next only to cervical and thyroid cancers. The latest available data from the DOH Tumor Census shows that ovarian cancer has an overall incidence rate of 6.4% in the Philippines, with 2.7% in the <20 year old age groups (Figure 5).[6] However, data is still lacking in terms of specific tissue diagnosis of ovarian cancer. The Philippine General Hospital in 2020, started their Tumor Registry, and so far has recorded only 1 case of IMCT. The Cancer Institute also recorded other cases of MCTs from which other ovarian carcinomas arose, but this is contained within the same ovary.

There have been records of IMCT with a contralateral MCT in other countries.[6] However, similar published reports in the Philippines is quite scarce.

A comprehensive pre-operative plan is warranted with guidance from tumor markers and imaging studies, as well as multidisciplinary approach from Pediatrics, Surgery, Gynecology, Oncology, and Pathology services.

Imaging studies are used to diagnose adnexal lesions. The goal of imaging is to differentiate adnexal masses from being benign or malignant so as to plan for further management. While benign masses can be followed up, indeterminate or frankly malignant lesions may warrant resection. For this, imaging is utilized for accurate tissue characterization. Transvaginal ultrasound is the preferred technique for initial evaluation because of its availability, low cost, high resolution, and lack of ionizing radiation. Operator expertise and patient body habitus are factors which could affect sensitivity and specificity of this technique. In the present case, transrectal ultrasound was supplemented by pelvic ultrasound because the huge size of the mass precluded a thorough sonologic investigation by doing transrectal ultrasound alone.[7]

Tumor markers requested included carcinoembryonic antigen (CEA), cancer antigen 125 (Ca 125), beta- human chorionic gonadotropin (bHCG), lactate dehydrogenase (LDH), and cancer antigen 19-9. Tumor markers mostly are nonspecific, but can help with diagnosis and surveillance in some carcinomas.

The Children's Oncology Group (COG) recommends the following when managing adnexal malignancies:[1] 1. Intact removal of the tumor without violation in situ; 2. Sparing of the fallopian tube if not adherent; 3. Obtaining ascites for cytology; 4. Examination and palpation of the omentum, with biopsy or removal of suspicious areas; and, 5. Examination and palpation of the iliac and aortocaval nodes, with biopsy of abnormal areas.[1] For early stage disease, standard practice is unilateral salpingooophorectomy, and, in the presence of a gynecologic oncologist, includes intra-operative frozen section, peritoneal cytology, careful and systematic abdominal exploration, inspection and palpation of peritoneal surfaces, biopsies of pelvic and peritoneal peritoneum, infracolic omentectomy, and pelvic and paraaortic lymphadenectomy.[4]

However, despite pre-operative planning, there was still some uncertainty until the operation and final histopathology. In this patient, after removal of the left ovarian mass and fallopian tube, which on frozen section revealed an IMCT, there was an incidental finding of a cyst on the contralateral ovary. Intraoperative decision-making should weigh the patient's future fertility against the possibility of tumor spread. Figure 6 presents the four-box method of bioethical considerations for this case. The patient's parents were informed of the frozen section results, intraoperative findings, and prognosis of the treatment plan. They were presented with either oophorocystectomy or salpingooophorectomy of the contralateral ovary. With complete removal of the ovary, the patient will be subjected to issues of infertility and early menopause, with cardiovascular disease, osteoporosis, and cancer risk. On the other hand, with oophorocystectomy, fertility is preserved but there is possibility of leaving neoplastic tissue

*Philippines, Manila (2003-2007)

Annual incidence per 100,000 by age group - Female

SITE	ALL AGES	AGE UNK	0-	5-	10-	15-	20-	25-	30-	35-	40-	45-	50-	55-	60-	65-	70-	75-	80+	CRUDE RATE	(%)	CUM 0-64	CUM 0-74	ASR (W)	ICD (10th)
Lip	3	0	-	-	-	-	-	-	-	-	-	0.1	0.2	-	-	0.5	-	-	-	0.0	0.0	0.00	0.00	**0.0**	*C00*
Tongue	95	2	-	-	-	0.1	-	0.1	0.2	0.5	0.2	1.1	0.7	2.9	4.7	6.6	9.3	7.4	8.6	0.6	0.4	0.05	0.13	**1.0**	*C01-02*
Mouth	92	2	-	-	-	0.1	0.2	0.2	0.4	0.2	0.3	0.5	0.7	2.9	3.4	2.3	4.0	16.9	16.1	0.6	0.4	0.05	0.08	**0.9**	*C03-06*
Salivary glands	86	2	-	0.1	0.3	0.3	0.3	0.2	0.2	0.4	1.1	0.7	0.8	2.7	3.4	4.7	3.3	3.2	2.1	0.6	0.4	0.05	0.09	**0.8**	*C07-08*
Tonsil	18	0	-	-	-	-	0.1	-	0.2	0.1	0.2	0.1	0.3	0.2	0.7	0.9	0.7	3.2	-	0.1	0.1	0.01	0.02	**0.2**	*C09*
Other oropharynx	11	0	0.1	-	-	-	-	-	-	-	-	0.1	0.2	0.5	0.3	0.5	0.7	-	2.1	0.1	0.0	0.01	0.01	**0.1**	*C10*
Nasopharynx	232	0	-	0.1	0.3	0.1	0.5	0.8	1.3	2.6	2.6	5.0	4.9	4.4	5.7	7.0	6.0	6.3	7.5	1.6	1.0	0.14	0.21	**2.0**	*C11*
Hypopharynx	8	0	-	-	-	-	-	-	0.1	-	-	-	-	0.5	0.7	0.5	0.7	1.1	-	0.1	0.0	0.01	0.01	**0.1**	*C12-13*
Pharynx unspecified	30	0	-	-	-	-	-	0.1	0.1	0.2	0.4	-	0.5	-	0.3	1.9	3.3	2.1	7.5	0.2	0.1	0.01	0.03	**0.3**	*C14*
Oesophagus	83	1	-	-	-	-	-	0.1	0.2	0.1	0.4	0.5	1.7	1.2	2.4	5.6	6.6	13.8	12.9	0.6	0.4	0.03	0.10	**0.9**	*C15*
Stomach	437	3	-	-	-	0.1	0.3	0.4	0.7	1.3	1.9	4.7	5.7	13.7	16.5	23.9	40.4	46.6	55.7	2.9	1.9	0.23	0.55	**4.7**	*C16*
Small intestine	27	0	-	-	-	-	0.1	0.1	0.2	-	0.2	0.1	0.7	0.7	2.4	0.9	1.3	2.1	-	0.2	0.1	0.02	0.03	**0.3**	*C17*
Colon	1259	10	0.1	-	-	0.1	0.4	1.1	2.2	4.3	6.6	11.8	20.1	30.4	48.5	73.5	110.5	140.8	171.5	8.4	5.6	0.63	1.56	**13.4**	*C18*
Rectum	670	9	-	-	-	0.1	0.5	1.1	1.4	2.8	5.6	6.5	11.9	18.2	28.3	39.3	44.3	52.9	64.3	4.5	3.0	0.39	0.81	**6.9**	*C19-20*
Anus	28	1	-	-	-	-	-	0.1	-	0.2	0.2	0.1	0.7	1.0	1.0	0.9	1.3	1.1	4.3	0.2	0.1	0.02	0.03	**0.3**	*C21*
Liver	706	7	0.3	0.1	0.4	0.3	0.4	0.6	1.2	2.1	5.3	5.8	8.7	19.4	23.9	40.3	56.2	80.4	98.6	4.7	3.1	0.35	0.83	**7.4**	*C22*
Gallbladder etc.	127	1	-	-	-	-	-	0.1	0.2	0.5	0.6	1.1	1.3	4.7	4.7	9.8	12.6	14.8	10.7	0.9	0.6	0.07	0.18	**1.4**	*C23-24*
Pancreas	334	4	-	0.1	-	-	0.1	0.1	0.4	0.5	1.0	2.4	4.5	5.4	16.2	23.4	26.5	46.6	63.3	2.2	1.5	0.15	0.41	**3.7**	*C25*
Nose, sinuses etc.	45	1	-	0.1	-	0.1	0.1	0.1	0.1	0.6	0.3	0.4	1.0	1.5	1.3	0.5	2.0	4.2	2.1	0.3	0.2	0.03	0.04	**0.4**	*C30-31*
Larynx	69	2	-	-	-	-	0.1	0.1	-	0.3	0.2	0.8	1.5	2.5	3.4	4.7	5.3	6.3	-	0.5	0.3	0.05	0.10	**0.7**	*C32*
Trachea, bronchus and lung	1379	10	-	-	-	0.1	0.6	1.1	1.6	3.9	8.6	12.6	23.9	41.5	53.3	87.1	119.1	127.0	167.2	9.3	6.2	0.74	1.78	**14.8**	*C33-34*
Other thoracic organs	33	0	0.1	-	0.1	-	-	0.1	-	0.2	-	0.1	0.7	1.7	1.0	2.3	0.7	2.1	4.3	0.2	0.1	0.02	0.04	**0.3**	*C37-38*
Bone	214	1	0.3	0.7	2.0	1.7	0.8	0.5	0.8	0.8	1.1	1.6	1.8	5.2	4.0	5.6	6.0	7.4	11.8	1.4	1.0	0.11	0.17	**1.8**	*C40-41*
Melanoma of skin	62	0	-	0.2	-	-	0.1	0.1	0.2	0.1	0.9	0.9	0.8	2.7	1.3	3.3	2.6	4.2	3.2	0.4	0.3	0.04	0.07	**0.6**	*C43*
Other skin	289	3	-	0.1	0.1	-	0.4	0.3	0.2	0.9	1.7	3.8	3.5	4.7	9.1	14.0	29.8	30.7	49.3	1.9		0.13	0.35	**3.0**	*C44*
Mesothelioma	3	0	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	0.7	1.1	-	0.0	0.0	0.00	0.00	**0.0**	*C45*
Kaposi sarcoma	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.00	0.00	**0.0**	*C46*
Connective and soft tissue	231	6	0.8	0.3	0.6	0.8	0.8	0.9	1.0	1.3	1.8	4.2	2.3	5.2	5.7	8.4	5.3	4.2	6.4	1.5	1.0	0.13	0.20	**2.0**	*C47+C49*
Breast	6491	56	-	0.1	0.1	0.2	1.9	6.5	19.6	46.9	90.6	137.1	161.6	208.1	212.4	224.8	232.2	240.2	255.2	43.5	29.0	4.46	6.77	**60.1**	*C50*
Vulva	42	0	-	-	-	-	-	-	-	0.3	-	0.3	0.2	1.5	2.0	4.2	2.6	7.4	4.3	0.3	0.2	0.02	0.06	**0.5**	*C51*
Vagina	33	0	0.1	-	-	-	-	0.1	-	0.2	0.4	0.5	0.8	1.7	0.7	0.9	0.7	1.1	2.1	0.2	0.1	0.02	0.03	**0.3**	*C52*
Cervix uteri	1991	18	-	-	-	0.1	0.3	2.6	8.0	18.4	34.5	49.6	61.7	57.9	32.0	57.6	37.1	51.9	32.2	13.4	8.9	1.34	1.82	**17.0**	*C53*
Corpus uteri	1108	7	-	-	-	0.1	0.4	0.9	3.0	7.2	11.6	21.9	32.3	45.4	45.5	37.9	35.7	36.0	21.4	7.4	4.9	0.85	1.22	**10.5**	*C54*
Uterus unspecified	238	1	-	-	-	-	0.5	0.6	0.5	1.5	3.4	5.3	4.3	7.6	6.4	10.3	11.9	6.3	7.5	1.6	1.1	0.15	0.26	**2.2**	*C55*
Ovary	1440	15	0.6	0.3	0.6	1.2	3.1	4.2	7.2	10.5	17.4	25.3	31.4	42.2	46.9	38.9	38.4	59.3	33.2	9.7	6.4	0.96	1.35	**12.6**	*C56*
Other female genital organs	15	0	-	-	-	-	0.1	-	-	-	0.1	0.1	0.3	0.7	1.3	0.9	-	-	-	0.1	0.1	0.01	0.02	**0.2**	*C57*
Placenta	40	0	-	-	-	0.1	0.2	0.4	0.8	0.6	0.3	0.9	0.3	0.2	-	-	-	-	-	0.3	0.2	0.02	0.02	**0.2**	*C58*
Kidney	221	4	0.8	0.2	0.1	0.2	0.1	0.5	0.5	0.9	2.3	3.0	4.3	5.4	8.4	8.4	6.6	12.7	17.2	1.5	1.0	0.14	0.21	**2.1**	*C64*
Renal pelvis	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.00	0.00	**0.0**	*C65*
Ureter	2	0	-	-	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-	-	-	0.0	0.0	0.00	0.00	**0.0**	*C66*
Bladder	135	1	-	-	-	-	-	-	0.3	0.3	1.0	0.5	1.5	2.2	6.4	8.9	12.6	18.0	23.6	0.9	0.6	0.06	0.17	**1.5**	*C67*
Other urinary organs	5	0	-	-	-	-	-	-	-	-	-	0.1	0.2	0.2	-	0.5	-	1.1	-	0.0	0.0	0.00	0.01	**0.1**	*C68*
Eye	51	3	1.9	0.5	-	-	-	0.1	-	-	0.2	0.1	-	0.5	-	-	2.0	2.1	-	0.3	0.2	0.02	0.03	**0.4**	*C69*
Brain, nervous system	259	4	1.1	1.5	1.0	0.6	0.3	0.9	1.2	1.8	1.3	2.3	4.0	3.7	6.7	11.2	8.6	7.4	10.7	1.7	1.2	0.13	0.23	**2.3**	*C70-72*
Thyroid	1579	18	-	0.1	0.5	1.5	5.7	8.7	14.9	19.0	19.3	21.0	29.4	28.5	33.0	39.8	31.1	47.6	27.9	10.6	7.0	0.92	1.28	**12.4**	*C73*
Adrenal gland	10	0	0.1	-	0.1	0.1	-	-	-	0.1	0.1	0.3	-	0.5	-	-	-	-	-	0.1	0.0	0.01	0.01	**0.1**	*C74*
Other endocrine	6	0	-	-	-	-	-	0.1	-	-	-	0.3	-	0.5	0.3	-	-	-	-	0.0	0.0	0.01	0.01	**0.1**	*C75*
Hodgkin lymphoma	68	0	-	0.1	0.1	0.5	1.0	0.5	0.3	0.3	0.6	0.3	0.3	1.2	0.7	2.3	0.7	1.1	3.2	0.5	0.3	0.03	0.04	**0.5**	*C81*
Non-Hodgkin lymphoma	541	2	0.8	0.9	0.9	0.6	1.1	1.4	1.7	2.0	4.4	6.2	7.4	14.2	14.5	24.8	35.1	41.3	36.5	3.6	2.4	0.28	0.58	**5.1**	*C82-85,C96*
Immunoproliferative diseases	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.00	0.00	**0.0**	*C88*
Multiple myeloma	87	0	-	-	-	-	-	-	-	0.6	0.2	1.1	1.5	4.4	3.4	3.7	7.9	6.3	8.6	0.6	0.4	0.06	0.11	**0.9**	*C90*
Lymphoid leukaemia	254	4	3.8	3.8	1.6	1.2	0.1	0.1	0.5	1.4	0.9	1.2	2.0	2.2	2.0	3.7	4.0	4.2	8.6	1.7	1.1	0.11	0.14	**2.0**	*C91*
Myeloid leukaemia	376	3	1.3	1.1	0.7	1.2	1.4	1.5	2.0	2.0	2.9	5.3	4.9	5.9	7.1	13.1	12.6	15.9	18.2	2.5	1.7	0.19	0.32	**3.2**	*C92-94*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Figure 5. The latest available data from the DOH Tumor Census shows that ovarian cancer is the third most common cancer in Filipino women, next only to Cervical and Thyroid cancers (6)

MEDICAL INDICATIONS	PATIENT PREFERENCES
- Adolescent with an Immature cystic teratoma on one ovary and an incidental finding of ovarian cyst on the other - IMCT has 10-15% chance of bilaterality - Goal to preserve contralateral ovary while assuring disease free outcome	- Intraoperative conference with parents since patient is under general anesthesia - Parents opted to undergo oophorocystectomy to preserve other ovary
QUALITY OF LIFE	**CONTEXTUAL FEATURES**
- Intraoperative conference with parents since patient is under general anesthesia - Removing both ovaries will significantly decrease fertility and subject patient to early menopause - Higher stage tumor may need chemotherapy and later second-look operation	- Early menopause will require more treatment because of risks for cardiovascular disease, osteoporosis - Chemotherapy highly effective in IMCT

Figure 6. Four- box method for ethical decision making with intraoperative findings of bilateral ovarian cysts.

behind.[6] It was also considered that due to the patient's small abdominal cavity, a comprehensive surgical staging cannot be achieved. Deviation from the standard procedure may not result in adverse outcomes, however more study is needed to affirm this.[4] Thus, the patient only underwent exploratory laparotomy, peritoneal fluid cytology, salpingooophorectomy left with frozen section, followed by oophorocystectomy right, selective lymph node dissection, random peritoneal sampling, and infracolic omentectomy.

Factors that increase survival include tumor grade, completion of resection, and age of onset, with tumor grade being the most important risk factor for relapse across all age groups.[5] For this case of adolescent age group with complete resection and Grade I tumor, overall survival is up to 99%. Chemotherapy is reserved for higher stage tumors and for recurrence as usually surgery is enough for early stage disease. Also, IMCT is highly sensitive to standard chemotherapy of bleomycin, etoposide, and cisplatin.[6]

Conclusion and Learning Points

In an adolescent presenting with abdominal pain, an extensive list of differentials should be noted, considering the age, signs and symptoms, laboratories and imaging of the patient. Immature cystic teratoma is not a common ovarian cyst, and definitively diagnosed by histology. Fertility sparing surgery is feasible for most patients, with excellent prognosis when found early. Finally, this report highlights the need for a case-specific National census of ovarian malignancies.

References

1. Eskander RN & Bristow RE. Adnexal masses in pediatric and adolescent females: A review of the literature. Curr Obstet Gynecol Rep 2012; 1: 25–32. DOI 10.1007/s13669-011-0001-4
2. Potisek NM & Antoon JW. Abdominal masses. Pediatr Rev 2017; 38(2): 101-3. DOI: 10.1542/pir.2016-0087
3. Der EM & Seidu S. Case Report of Three Immature Cystic Teratomas in Northern Ghana. Hindawi Case Reports in Obstetrics and Gynecology 2019. https://doi.org/10.1155/2019/1210509
4. Gershenson DM. Management of ovarian germ cell tumors. J Clin Oncol 2007; 25(20): 2938-43. doi: 10.1200/JCO.2007.10.8738.
5. PashankarF, Hale JP, Chir MB, Dang H, Krailo M, Brady WE, et al. Is adjuvant chemotherapy indicated in ovarian immature teratomas? A combined data analysis from the Malignant Germ Cell Tumor International Collaborative. Cancer 2016; 122(2): 230-7. doi:10.1002/cncr.29732.
6. Zhao T, Liu Y, Wang X, Zhang H, & Lu Y. Ovarian cystectomy in the treatment of apparent early-stage immature teratoma. J Int Med Res 2017; 45(2): 771-80. DOI: 10.1177/0300060517692149
7. Mehta NY & Copelin EL. (2020, June 23). Abdominal abscess. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK519573/
8. World Health Organization. Cancer Incidence in Five Continents Vol. X. France: International Agency for Research on Cancer 2014.
9. Iyer VR & Lee SI. MRI, CT, and PET/CT for ovarian cancer detection and adnexal lesion characterization. Am J Radion 2010; 194: 311–21. DOI: 10.2214/AJR.09.3522