

A Histological Study of 1455 Ovarian Tumors

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ABSTRACT

Over a period of 12 years from 1973 through 1984, a total of 1455 ovarian tumors have been diagnosed at this department. Of this number, 1157 (79.52%) are benign, 246 (16.91%) malignant and 52 (3.57%) metastatic.

Common epithelial tumors comprise 53.31%, germ cell tumors 38.78%, sex cord-stromal tumors 7.70% and the soft tissue tumors, not specific to ovary 0.21% of all primary ovarian neoplasms. The most frequently encountered ovarian tumor at this department is dermoid cyst which accounts for 34% (480/1403) of all primary ovarian tumors and is followed in decreasing frequency by mucinous tumor (benign 21.60%; malignant 4.70%) and serous tumor (benign 17.39%; malignant 3.49%). The most common malignant ovarian lesion is mucinous tumor (borderline cases included), with serous tumor closely next to it and the undifferentiated adenocarcinoma ranks the third in frequency.

About 70% of all primary ovarian neoplasms have occurred in patients during their reproductive years, 2.5% in children and more than 27% in postmenopausal women.

Three-fourths of all benign ovarian tumors have developed in women before the age of 45 years and 45% of malignant forms are encountered in patients beyond that age.

In Children, the majority of their ovarian tumors are germ cell in origin, with the dermoid cyst constituting nearly 77% of all benign ovarian neoplasms and the immature solid teratoma, 66% of all malignant ones.

In postmenopausal women, mucinous as well as serous tumors are the two most common ovarian neoplasms, both in benign and in malignant categories.

There are 52 secondary ovarian tumors to be encountered. The majority (45/52) of which are adenocarcinoma. The most common known primary site is stomach.

Key words: benign and malignant ovarian tumors; dermoid cyst; serous tumor; mucinous tumor; percentage; frequency; age distribution; bilaterality.

Ovarian tumors which constitute a considerable proportion of clinically important neoplasms in female appear to be an environmental and/or a cultural diseases^(1,2).

Higher ovarian cancer rates are reported from higher industrialized countries (Table 1). The rates of death from ovarian cancer range from 11.02/100,000 in Denmark, 7.04/100,000 in the U.S., 1.69/100,000 in Japan⁽³⁾ and 0.49/100,000 in Taiwan⁽⁴⁾, where ovarian cancer is the tenth most frequent cancer death in women, while in the U.S., ovarian malignancy ranks the fourth most frequent fatal cancer in women^(5,6).

In Taiwan, malignant ovarian tumors account for 1.7% of total cancer death in female, and 16% of those who die from cancer of the female genital organ⁽⁴⁾. In contrast, in the U.S., the corresponding data are 6% and 47% respectively⁽⁷⁾.

The ovary, compared to other organs in the human body, produces the greatest variety of neoplasm and because of wide

differences in terminology applied throughout the world, it has been very difficult or even impossible to interpret and compare the reported results from different sources. This and some other factors make present epidemiologic data are inadequate in quantity and quality. With this in mind, we decided to collect all ovarian tumors diagnosed at this department during a period of 12 years, from 1973 through 1984, and have them reviewed and reclassified according to the WHO classification. Hoping, that these attempts might be as some support for those who are trying, through epidemiology, to identify causes and reduces occurrences of the disease.

MATERIALS AND METHODS

The materials consisted of all ovarian surgical specimens examined at Department of Pathology, Taipei Medical College in a period of 12 years from 1973 through 1984.

The specimens were mostly removed

Table 1. Relative Incidence of Ovarian Cancer Death in Various Countries

Incidence Nation Nation	Death rate from ovarian cancer	% of ovarian tumors in cancer death of female population	% of ovarian tumors in cancer death of female genital organs
Denmark	11.02/100,000		
United States	7.04/100,000	6%	47%
Japan	1.69/100,000		
Taiwan	0.49/100,000	1.7%	16%

by unilateral or bilateral salpingo-oophorectomy except for a few biopsy cases. The majority of the materials were submitted by practitioners and hospitals distributed throughout the whole island.

All specimens were measured and many, weighed before or after fixation. After careful gross examination, several to numerous representative blocks were taken for histological study. In addition to routine Hematoxylin-Eosin stain, special stains such as mucicarmine, PAS, Masson and fat stains, etc., were employed when necessary for differential diagnosis. Specimens did not show significant pathologic changes were excluded.

A total of 1455 primary and secondary ovarian tumors have been collected. Many cases, with an emphasis on the germ cell tumor category, their medical history and pathological report were reviewed and microscopic sections re-examined. Some cases were reclassified according to the WHO classification.

RESULTS

The classification we used is chiefly based on that of the "Histologic Typing of ovarian Tumors" published by World Health Organization in 1973. (Table 2)

After study on and analysis of clinical records and histologic sections, results of the classification and age distribution of 1455 ovarian tumors are shown in Table 3, 4, 5, and 6.

1. Common Epithelial Tumors

Common epithelial tumors are not

Table 4. 1455 Cases of Ovarian Tumor

	Benign	Malignant	Metastatic	Total
No. of cases	1157	246	52	1455
%	79.52%	16.91%	3.57%	100%

an entity but a group of diseases, they are thought to be derived from surface epithelium with participation of the underlying stroma.

There are several cellular subtypes of the common epithelial tumors. It is important to correctly identify them, especially the malignant ones, because differences in manner of the spread, prognosis and treatment do exist^(8,9).

In this series, we found that the majority of the common epithelial tumors were of serous and mucinous types (see Table 7), they together accounted for 88.50% (662/748) of total common epithelial tumors and 47% of all primary ovarian tumors. The ratio of serous to mucinous tumor was 4 to 5. The serous tumors constituted 20.88% of all primary ovarian tumors (benign 17.39%, malignant 3.49%), and the mucinous 26.30% (benign 21.60%, malignant 4.70%).

A. Serous tumors

The benign serous tumors, with the adenofibroma and cystadenofibroma discussed separately, accounted for 21% of all benign ovarian neoplasms. We divided them into two subgroups. One-third were simple serous cyst, a monolocular serous cyst without papillary formations, and the other two-thirds, serous cystadenoma, a multilocular serous cyst with or without

Table 2. Histologic Classification of Ovarian Tumors

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- I. Common "Epithelial" Tumors
 - A. Serous tumors
 - 1. Benign
 - a. Cystadenoma and papillary cystadenoma
 - b. Surface papilloma
 - c. Adenofibroma and cystadenofibroma
 - 2. Of borderline malignancy (carcinomas of low malignant potential)
 - a. Cystadenoma and papillary cystadenoma
 - b. Surface papilloma
 - c. Adenofibroma and cystadenofibroma
 - 3. Malignant
 - a. Adenocarcinoma, papillary adenocarcinoma, and papillary cystadenocarcinoma
 - b. Surface papillary carcinoma
 - c. Malignant adenofibroma and cystadenofibroma
 - B. Mucinous tumors
 - 1. Benign
 - a. Cystadenoma
 - b. Adenofibroma and cystadenofibroma
 - 2. Of borderline malignancy (carcinomas of low malignant potential)
 - a. Cystadenoma
 - b. Adenofibroma and cystadenofibroma
 - 3. Malignant
 - a. Adenocarcinoma and cystadenocarcinoma
 - b. Malignant adenofibroma and cystadenofibroma
 - C. Endometrioid tumors
 - 1. Benign
 - a. Adenoma and cystadenoma
 - b. Adenofibroma and cystadenofibroma
 - 2. Of borderline malignancy (carcinomas of low malignant potential)
 - a. Adenoma and cystadenoma
 - b. Adenofibroma and cystadenofibroma
 - 3. Malignant
 - a. Carcinoma
 - (1) Adenocarcinoma
 - (2) Adenocanthoma
 - (3) Malignant adenofibroma and cystadenofibroma
 - b. Endometrioid stromal sarcomas
 - c. Mesodermal (müllerian) mixed tumors, homologous and heterologous
 - D. Clear cell (mesonephroid) tumors
 - 1. Benign: adenofibroma
 - 2. Of borderline malignancy (carcinomas of low malignant potential)
 - 3. Malignant: Carcinoma and adenocarcinoma
 - E. Brenner tumors
 - 1. Benign
 - 2. Of borderline malignancy (proliferating)
 - 3. Malignant
 - F. Mixed epithelial tumors
 - 1. Benign
 - 2. Of borderline malignancy
 - 3. Malignant
 - G. Undifferentiated carcinoma
 - H. Unclassified epithelial tumors
 - II. Sex Cord Stromal Tumors
 - A. Granulosa-stromal cell tumors
 - 1. Granulosa cell tumor
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Table 2. (Continued)

2.	Tumors in the thecoma-fibroma group
a.	Thecoma
b.	Fibroma
c.	Unclassified
B.	Androblastomas; Sertoli-Leydig cell tumors
1.	Well differentiated
a.	Tubular androblastoma; Sertoli cell tumor (tubular adenoma of Pick)
b.	Tubular androblastoma with lipid storage; Sertoli cell tumor with lipid storage (folliculome lipidique of Lecene)
c.	Sertoli-Leydig cell tumor (tubular adenoma with Leydig cells)
d.	Leydig cell tumor; hilus cell tumor
2.	Of intermediate differentiation
3.	Poorly differentiated (sarcomatoid)
4.	With heterologous elements
C.	Gynandroblastoma
D.	Unclassified
III.	Lipid (Lipoid) Cell Tumors
IV.	Germ Cell Tumors
A.	Dysgerminoma
B.	Endodermal Sinus Tumor
C.	Embryonal Carcinoma
D.	Polyembryoma
E.	Choriocarcinoma
F.	Teratomas
1.	Immature
2.	Mature
a.	Solid
b.	Cystic
(1)	Dermoid cyst (mature cystic teratoma)
(2)	Dermoid cyst with malignant transformation
3.	Monodermal and highly specialized
a.	Struma ovarii
b.	Carcinoid
c.	Struma ovarii and carcinoid
d.	Others
G.	Mixed forms
V.	Gonadoblastoma
A.	Pure
B.	Mixed with dysgerminoma or other form of germ cell tumor
VI.	Soft Tissue Tumors Not Specific to Ovary
VII.	Unclassified Tumors
VIII.	Secondary (Metastatic) Tumors
IX.	Tumor-Like Conditions
A.	Pregnancy luteoma
B.	Hyperplasia of ovarian stroma and hyperthecosis
C.	Massive edema
D.	Solitary follicle cyst and corpus luteum cyst
E.	Multiple follicle cysts (polycystic ovaries)
F.	Multiple luteinized follicle cysts and/or corpora lutea
G.	Endometriosis
H.	Surface-epithelial inclusion cysts (germinal inclusion cysts)
I.	Simple cysts
J.	Inflammatory lesions
K.	Parovarian cysts

Table 3.

		748			
I.	Common Epithelial Tumors	314	265	244	
A.	Serous tumors			21	
1.	Benign				
	Cystadenoma and papillary cystadenoma				
	Adenofibroma and cystadenofibroma		25		
2.	Of borderline malignancy		24		
3.	Malignant	369			
B.	Mucinous tumors		303		
1.	Benign		42		
2.	Of borderline malignancy		24		
3.	Malignant	9			
C.	Endometrioid tumors		9		
	Endometrioid carcinoma	17			
D.	Clear cell tumors		17		
	Clear cell carcinoma	9			
E.	Brenner tumors		7		
1.	Benign		1		
2.	Of borderline malignancy		1		
3.	Malignant	0			
F.	Mixed epithelial tumors	30			
G.	Undifferentiated adenocarcinoma	0			
H.	Unclassified epithelial tumors				
II.	Sex Cord Stromal Tumors	108	106	19	
A.	Granulosa-stroma cell tumors			87	
1.	Granulosa cell tumor				12
2.	Tumors in the thecoma-fibroma group				74
	Thecoma				1
	Fibroma				
	Unclassified	1			
B.	Androblastomas; Sertoli-Leydig cell tumors		1		
1.	Well differentiated				
	Tubular androblastoma; Sertoli cell tumor			0	
2.	Of intermediate differentiation			0	
3.	Poorly differentiated			0	
4.	With heterologous elements	0			
C.	Gynandroblastoma	1			
D.	Unclassified	0			
III.	Lipid (Lipoid) Cell Tumors	544			
IV.	Germ Cell Tumors		12		
A.	Dysgerminoma		13		
B.	Endodermal sinus tumor		0		
C.	Embryonal carcinoma		0		
D.	Polyembryoma		1		
E.	Choriocarcinoma	515			
F.	Teratomas		13		
1.	Immature		496		
2.	Mature			7	
	Solid			489	
	Cystic				480
	a. Dermoid cyst				9
	b. Dermoid cyst with malignant transformation		6		
3.	Monodermal and highly specialized			5	
	a. Struma ovarii			1	
	b. Carcinoid			0	
	c. Struma ovarii and carcinoid			0	
	d. Others	3			
G.	Mixed forms	0			
V.	Gonadoblastoma	3			
VI.	Soft Tissue Tumors Not Specific to Ovary	0			
VII.	Unclassified Tumors	52			
IIIX.	Secondary (Metastatic) Tumors				

Table 5. Relative Incidence of 1403 Primary Ovarian Tumors

Type of tumor	Benign		Malignant		Total	
	No. of cases	% of 1403 cases	No. of cases	% of 1403 cases	No. of cases	% of 1403 cases
Common epithelial tumors	575	40.98%	173	12.33%	748	53.31%
Sex cord-stromal tumors	87	6.20%	21	1.50%	108	7.70%
Germ cell tumors	492	35.07%	52	3.71%	544	38.78%
Soft tissue tumors not specific to the ovary	3	0.21%	0	0%	3	0.21%
Total	1157	82.46%	246	17.54%	1403	100%

Table 6. Age Distribution of 1403 Primary Ovarian Tumors

Type	age 14 and under	15-19	20-29	30-39	40-45	46-49	50-59	60-69	70-79	80 and above	Total
Benign	26	51	399	279	125	59	135	56	18	1	1149*
Malignant	8	13	44	42	28	24	51	25	9	2	246
Total	34	64	443	321	153	83	186	81	27	3	1395

*8 patients with unknown age not shown

papillary projections. Differences of age distribution (Table 8) and bilaterality did exist between these two neoplasms. The simple serous cyst showed a bilaterality of 3.66% (3/82) and a peak frequency of age distribution at second and third decades, and the serous cystadenoma, a bilaterality of 10.49% (17/162) and a peak frequency of age distribution between second and fifth decades.

Borderline malignancy as well as malignant serous tumors together constituted nearly 20% (49/246) of all ovarian cancers and they also accounted for 8.5% and 8.2% of total serous neoplasms respectively. We might expect that approximately in every 6 cases of serous tumor, one would

be either a borderline malignancy or a carcinoma.

The majority (96%) of the serous borderline cases occurred between the age of 20 and 59 years and about 80% of the patients with invasive serous cancer were during their fourth and fifth decades of life. Twenty-eight percent (7/25) of borderline and 16% (4/24) of invasive tumors were bilateral. Seventy percent of the invasive neoplasms were right sided with the right to left ratio of 5 to 1.

Adeno- and cystadenofibroma are benign ovarian neoplasm, histologically characterized by a prominent fibrous connective tissue with interspersed glandular spaces of various sizes. The former is pri-

Table 7. Relative Incidence of Common Epithelial Tumors of 1403 Primary Ovarian Neoplasms

Tumor type	Benign		Borderline		Malignant		Total	
	No. of cases	% of 1403 cases	No. of cases	% of 1403 cases	No. of cases	% of 1403 cases	No. of cases	% of 1403 cases
Serous tumor	244	17.39%	25	1.78%	24	1.71%	293	20.88%
Mucinous tumor	303	21.60%	42	2.99%	24	1.71%	369	26.30%
Endometrioid carcinoma	0	0%	0	0%	9	0.64%	9	0.64%
Clear cell carcinoma	0	0%	0	0%	17	1.21%	17	1.21%
Brenner tumor	7	0.50%	1	0.07%	1	0.07%	9	0.64%
Adenofibroma and cystadenofibroma	21	1.50%	0	0%	0	0%	21	1.50%
Adenocarcinoma undifferentiated	0	0%	0	0%	30	2.14%	30	2.14%
Total	575	40.99%	68	4.84%	105	7.48%	748	53.31%

Table 8.

Tumor type	age 14 and under	15-19	20-29	30-39	40-49	50-59	60-69	70-79	80 and above	Total
Benign	1	7	65	59	46	39	22	5	0	244
Simple serous cyst	0	2	32	26	11	8	2	1	0	82
Cystadenoma	1	5	33	33	35	31	20	4	0	162
Borderline malignancy	0	0	7	7	6	4	1	0	0	25
Malignant	0	0	0	5	10	9	0	0	0	24
Total	1	7	72	71	62	52	23	5	0	293

marily a solid tumor and the latter, a cystic one, and they are usually discussed together in most literatures. These tumors originate from surface epithelium and underlying stroma of the ovary, and are considered as müllerian derivation⁽¹⁰⁾. Some look upon them as mere variant of serous cystadenoma, while others regard them as separate tumors.

In this study, we encountered 6 cystadenofibromas and 15 adenofibromas. They both together constituted 1.82% of all

benign ovarian tumors. The age of most patients of cystadenofibroma were older than 40 years with a mean of 45.5, while, 78% of the patients of adenofibroma were under 40 with a mean of 34 years. None of these tumors was bilateral.

B. Mucinous tumors

B. Twenty six percent (303/1157) of all benign ovarian neoplasms were mucinous cystadenoma and nearly 27 percent of all primary ovarian malignances were borderline and invasive mucinous cystadeno-

Table 9. Age Distribution of Mucinous Tumors

Tumor type	age 14 and under	15-19	20-29	30-39	40-49	50-59	60-69	70-79	80 and above	un- known	Total
Benign	4	23	95	61	50	42	17	10	0	1	303
Borderline malignancy	0	6	7	9	5	9	4	2	0	0	42
Malignant	0	0	5	2	5	6	3	2	1	0	24
Total	4	29	107	72	60	57	24	14	1	1	369

carinoma (borderline 17.07%; invasive, 9.76%).

Although the benign mucinous tumors were more commonly encountered in the reproductive age group particularly during the second and third decades, they were not infrequently found in patients under 20 and above 60 years of age. (Table 9)

Regarding the bilaterality, the benign forms had an incidence of 2.7% and the malignant ones 1.5%, that was one in 66 cases. These figures were much lower in mucinous tumors than that of serous ones (benign 8.2%; malignant 16%).

C. Endometrioid tumors

Endometrioid carcinoma of the ovary is defined as a primary ovarian carcinoma that resembles the architecture feature and cellular component of endometrial adenocarcinoma or adenoacanthoma. Since most endometrioid cancers are thought to arise from the surface epithelium rather than from the endometriotic tissue⁽¹¹⁾, the poorly differentiated endometrioid carcinoma can create a real problem to differentiate from the serous and the mucinous adenocarcinomas, especially the serous ones⁽¹²⁾.

In this study, we collected only 9

cases of endometrioid carcinoma which revealed a definite histologic pictures of such diagnosis. These tumors accounted for 0.64% (9/1403) of all primary ovarian tumors and 3.66% (9/246) of all primary ovarian malignant neoplasms.

The mean age of these patients was 48 years. 16.7% of these neoplasms showed bilaterality.

D. Clear cell tumors

The clear cell tumors of the ovary were at one time considered to be of mesonephric origin and acquired the name of mesonephroma, but now these tumors are generally accepted to be of müllerian origin⁽¹³⁾.

Clear cell carcinomas of the ovary in this study, constituted about 1.2% (17/1403) of all primary ovarian tumors and 6.9% (17/246) of ovarian cancers. The mean age of the patients was 35 years, with a range from 15 to 64. None of these tumors showed bilaterality.

E. Brenner tumors

In 1907, this tumor was first described by Dr. Fritz Brenner as "oophorema folliculare" and was thought to be a granulosa cell origin⁽¹⁴⁾. Now it is believed to be derived from the surface epithelium and

thus, included in the common epithelium category.

We have collected 9 Brenner tumors, of them 7 were benign, one borderline malignancy and one malignant. They constituted 0.64% (9/1403) of all primary ovarian tumors. The mean age of patients of the benign tumor was 50 and of the borderline and the malignant ones, 64.5 years. The bilaterality of these tumors was 11%.

F. Adenocarcinoma, undifferentiated

The basic histologic structure of these neoplasm is adenocarcinomatous, but the overall picture shows little or no differentiation toward any specific common epithelial tumors. The great majority of this type of tumor are an undifferentiated forms of serous or endometrioid carcinoma. The frequency of this tumor diagnosed depends to some extent on the criteria used by the reporting pathologist to place a poorly differentiated adenocarcinoma in a more specific category.

In this series, these neoplasms accounted for nearly 12.20% (30/246) of all primary malignant ovarian carcinomas and 17.34% (30/173) of all cases of common epithelial carcinomas. The age of these patients ranged from 29 to 70 with a mean of 50 years, and 26% of these tumors were bilateral.

II. Sex cord-stromal tumors

This category of ovarian neoplasms included all those that originate either from the sex cord of the embryonic gonad (which precede the differentiation of gonadal mesenchyme into male or female)

or from the stroma of the ovary⁽¹⁵⁾.

Sex cord-stromal tumors, as a group, accounted for 7.7% of all primary ovarian neoplasms in this series, and their malignant forms, approximately 8.5% of all primary ovarian cancers. The majority (19/21) of the malignant tumors belonging to this category were granulosa cell tumor which is of low grade malignancy.

A. Granulosa stromal cell tumors

1. Granulosa cell tumor

This tumor may be composed either entirely of granulosa cell or contains a small to large component of theca cells and/or fibroblasts.

In this series, 19 cases of granulosa cell tumor were encountered, including 6 cases which were previously diagnosed as granulosa-theca cell tumor.

The tumor constituted 1.35% (19/1403) of all primary ovarian tumors.

About 95% of the patients were adult and more than 50%, postmenopausal. Third and fifth decades were the two peak age distributions. Only one patient was before her puberty. She was 8 years of age and didn't reveal evidence of isosexual precocity. Bilaterality was found in only one case.

2. Thecoma-fibroma group

Neither light nor electron microscopic examination can make a sharp distinction between the thecoma and fibroma of the ovary⁽¹⁶⁾. In the thecoma, the stromal cells differentiate predominantly in the direction of estrogen-producing theca cells. In the fibroma, differentiation is toward collagen-producing fibroblasts. Only a biochemical approach demonstrate the

nature of the intermediate forms with certainty⁽¹⁷⁾.

a. Thecoma

This tumor is composed of stromal cells laden with lipid and resembling to theca cells.

In this study, the thecoma constituted only 0.86% (12/1403) of all primary ovarian tumors. The age distribution showed a peak at the fifth decade. Forty percent of the patients were postmenopausal and 60% premenopausal with a mean of 25 years of age in the latter group.

All tumors were confined to one ovary with more than 70% being left sided.

b. Fibroma

There are 74 ovarian fibromas in this series, they constituted 5.27% (74/1403) of all primary ovarian tumors.

About 59% of the tumors occurred during the premenopausal period with none of them before the age of 20 years. The average age of the patients was 43.5 years.

Only one tumor showed bilaterality.

c. Unclassified, sclerosing stromal tumor

Sclerosing stromal tumor is a recently recognized tumor which has characteristic pathologic as well as clinical features. More than 80% of these neoplasms have been encountered in patients in second and third decades, unlike the fibroma and thecoma, which occur in patients under the age of 30 years in less than 10% of the cases⁽¹⁷⁾. These tumors appear only occasionally to be associated with estrogen effects⁽¹⁸⁾.

In this study, a case of sclerosing stromal tumor was encountered in a 44 years old patient. She presented with a

right lower abdominal mass without pain. The tumor was 5.0x3.5cm in size.

B. Androblastomas, Sertoli-Leydig cell tumors

These tumors are composed of varying proportions of Sertoli and Leydig cells in different degrees of cellular differentiation. Classically, they have been known as masculinizing tumors, but now it has been well established that some of these neoplasms have no endocrine activity at all, while others may present estrogenic syndrome.

In this study, we encountered only one case of well differentiated Sertoli cell tumor (tubular androblastoma) which occurred in a child at the age of 8 years. She presented with vaginal spotting for two weeks and intermittent lower abdominal pain for 3 days. Breasts enlargement had been noticed for 6 months and lower abdominal mass for 2 months.

At operation, a left ovarian tumor, 12x10x5 cm in size was found. The tumor was partly cystic and partly solid. Microscopically, this tumor was characterized by solid and hollow tubules, lined by Sertoli cells with no Leydig cells between the tubules.

C. Unclassified

Sex cord tumor with annular tubules

This is an unclassified sex cord-stromal tumors characterized by simple and complex annular tubules. These tumors are very rare and have been found in both children and adults, with most of them being discovered during the second and third decades⁽¹⁹⁾.

They may be estrogenic or nonfunc-

tioning. Their behavior has occasionally been malignant, and an interesting feature has been the presence of these neoplasms in patients with Peutz-Jeghers syndrome⁽¹⁹⁾.

We have encountered a tumor of this kind which occurred in a 34 years old patient. She presented with vaginal spotting and hypermenorrhea. At operation, a right ovarian tumor, 5x4.5x3.5 cm in size, was found. Microscopically, this tumor revealed a textbook picture. It was characterized by simple and complex annular tubules with nuclei oriented around the periphery and a central round body of hyalinized material in the former and intercommunicating rings revolving around multiple hyaline bodies in the latter.

III. Germ Cell Tumors

This group of tumors includes a number of histologically different tumor types. They are thought to be derived from the primitive germ cell of the embryonic gonad.

In this study, 38.78% of all ovarian tumors were of germ cell origin (Table 10). The benign forms, almost all of which were dermoid cysts, constituted 42.5% (492/1157) of all benign ovarian neoplasms, and the malignant ones, which accounted for 9.5% (52/544) of all germ cell tumors, has made up 21% (52/246) of all ovarian cancers.

Lower frequency of these tumors are reported from the U.S.. Scully⁽²⁰⁾ stated the following data in his book: the germ cell tumors constitute 20 to 25% of all ovarian tumors. The benign ones account for nearly one-third of all benign ovarian tumors. Two to three percent of all germ cell tumors are malignant, which account for approximately 2% of all ovarian malignancies.

A. Dysgerminoma

Dysgerminoma is a rare form of malignant germ cell tumor which is composed of large, rounded uniform cells with clear cytoplasm separated by delicate

Table 10. Relative Incidence of Germ Cell Tumors of 1403 Primary Ovarian Tumors

Tumor type	Frequency	No. of Cases		Percentage
		Benign	Malignant	
Dysgerminoma			12	0.86%
Endodermal sinus tumor			13	0.93%
Teratoma	492		23	36.71%
Choriocarcinoma			1	0.07%
Embryonal carcinoma			0	0%
Polyembryonal carcinoma			0	0%
Mixed tumor			3	0.21%
Gonadoblastoma			0	0%
Total		492	52	38.78%

strands of connective tissue containing lymphocytes.

The tumor cells show similarity to primordial germ cells on both histologic and histochemical examination.

In this study, dysgerminoma was also a rare tumor and most cases occurred in adolescence and early adult life. These tumors accounted for 0.86% of all primary ovarian neoplasms and nearly 4.9% of all primary ovarian malignancies. The patients ranged between the age of 8 and 38 years with a median of 21 and a mean of 22 years. About 50% of cases were encountered before the age of 20 years.

The tumors were usually round or lobulated, often large, ranging from 5.5cm to 20cm in largest diameter with a mean of 13.25cm. The most common complaint on presentation was abdominal swelling, usually accompanied by pain and a palpable lower abdominal mass. In one case, the patient had an episode of severe acute abdominal pain which was later found to be caused by tumor rupture. All tumors were one-sided. There was no evidence of direct spread or metastasis to be demonstrated.

B. Endodermal sinus tumor

A malignant germ cell neoplasm that is now considered to arise from extra-embryonic mesoderm and endoderm. The term "endodermal sinus tumor" was used because of the similarity of structure in the neoplasm to those of the endodermal sinuses of the yolk sac of the rodent⁽²¹⁾. Alpha-fetoprotein has been demonstrated in tumor cells and hyaline bodies by immunohistochemical techniques^(22,23).

Due to its relative rarity and com-

paratively late recognition as a specific entity, the exact incidence of this tumor is difficult to assess. Over these years, it has been diagnosed under a variety of names, such as yolk sac tumor; embryonal carcinoma; embryonal adenocarcinoma; mesonephroma and polyvesicular vitelline tumor etc..

In this study, we encountered 13 cases of endodermal sinus tumor, seven of which were previously diagnosed as mesonephroma, embryonal carcinoma or embryonal adenocarcinoma.

Most cases occurred during second and third decades. The age of the patients ranged from 17 to 34, with a median of 23 and a mean of 24.6 years. All tumors were confined to one ovary.

The tumors constitute 0.93% of all primary ovarian neoplasms and 5.28% of all primary ovarian cancers.

Abdominal mass was the most common presenting symptom. Abdominal distention or abdominal pain as an initial complaint was also not infrequent. Abnormal vaginal bleeding, manifested as irregular menses, occurred in only one patient. None of the patients showed evidence of virilization or hyperestrinism. One patient suffered from sudden onset of severe abdominal pain which was later discovered to be caused by tumor rupture.

Grossly, the greatest diameter of the tumors ranged from 8 to 26cm. Small to large hemorrhagic and necrotic foci were common findings.

C. Teratoma

It may be stated that the teratoma is a true neoplasms which contains tissues

Table 11. Relative Incidence of 515 Teratomas

Tumor types	No. of cases	Percentage
Cystic teratoma, mature	489	94.95%
Benign	480	93.20%
Malignant transformation	9	1.75%
Solid teratoma	20	3.88%
Mature	7	1.36%
Immature	13	2.52%
Monodermal	6	1.17%
Struma ovarii	5	0.97%
Carcinoid	1	0.20%
Struma ovarii and carcinoid	0	0%
Total	515	100%

arising from more than one germ cell layer and foreign to the organ in which it resides⁽²⁴⁾.

Teratoma can be primarily divided into three subgroups: mature, immature and monodermal. Their classification and percentage are shown in Table 11.

1. Mature teratoma, cystic

a. Dermoid cyst

The majority of mature teratoma of the ovary are benign and cystic, and the predominant element of this tumor is usually of ectodermal origin. This lesion is commonly known as dermoid cyst, in this series, which is not only the most common type of ovarian teratomas, and of ovarian germ cell neoplasms, but also the most common tumor developed in children and in women during the reproductive years.

These neoplasms accounted for approximately 93.2% (480/515) of all ovarian teratomas, 88% (480/544) of all ovarian germ cell tumors, 34% (480/1403) of all ovarian newgrowths, and 41.5% (480/1157)

of all benign ovarian tumors.

Over 81% (386/473) of dermoids occurred between the age of 20 and 45 years, 10% in postmenopausal women, and 8% before the age of 20 years (Table 12). Nine percent of these dermoid cysts were bilateral.

About 5.8% dermoid cysts have occurred in association with a contralateral or an ipsilateral serous or mucinous cystadenoma, with these two tumors equal in number of cases.

b. Dermoid cyst with malignant transformation

Malignant transformation is an uncommon complication of mature cystic teratoma, in which one of the tissue elements has undergone a malignant change. These tumors are usually focal, incidentally discovered, and tend to occur in elderly patients⁽²⁵⁾.

The most frequent malignant evolution is that of squamous carcinoma. Over 75% of cases have been encountered between the ages of 30 and 70, with a peak incidence

Table 12. Age Distribution of Cystic and Solid Teratomas

Tumor type	age 14 and under	15-19	20-29	30-39	40-45	46-49	50-59	60-69	70-79	80 and above	un- known	Total
Cystic teratoma, mature												
Benign (Dermoid cyst)	20	18	206	134	46	15	27	5	1	1	7	480
With malignant change	0	0	0	2	1	0	3	1	1	1	0	9
Solid teratoma												
Mature	1	1	4	1	0	0	0	0	0	0	0	7
Immature	4	0	7	1	1	0	0	0	0	0	0	13
Total	25	19	217	138	48	15	30	6	2	2	7	509

between 40 and 60 years.

In this series, 9 cases of dermoid cysts with malignant transformation were detected. They accounted for 1.85% of all cystic teratomas and 3.66% of all primary ovarian cancers.

The age of patients ranged from 30 to 78 years with a median of 55 and a mean of 52 years. All patients presented with lower abdominal mass and/or pain. None had suffered from vaginal bleeding. Most tumors were confined to one ovary, with only one case to be associated with a contralateral benign cystic teratoma.

Among these 9 cases, 6 were squamous cell carcinoma, 2 adenocarcinoma, and 1 carcinoid. Of the two adenocarcinomas, one revealed a histologic picture of that of mucinous cystadenocarcinoma, and the other showed microscopical cystic wall invasion.

The average greatest diameter of these tumors was 12 cm, the range being 6 to 25 cm. Clinically, they couldn't be readily differentiated from an uncomplicated ma-

ture cystic teratoma or other ovarian tumors. All these cases were found as an incidental observation.

2. Solid teratoma, mature and immature

These much less frequent tumors, present a varied microscopic appearance, are composed of varying proportions of mature and immature tissues, derived from three germ layers.

It has been suggested that there is a relationship between the histologic appearance of the tumor and its prognosis. Tumors which are composed exclusively of mature tissue elements, have been considered as benign, which of much immature ones, to be associated with a fatal course. Lesions with intermediate maturity, pursue a variable outcome⁽²⁶⁾. Mature solid teratoma associated with peritoneal implants made up entirely of mature glial tissue shows an excellent prognosis⁽²⁷⁾.

In this study, we collected 20 cases of solid teratoma. They constituted 3.88% (20/515) of ovarian teratomas and 1.43% (20/1403) of all primary ovarian neoplasms.

The patient's records, including the operative summaries, surgical and pathology reports were studied for correlation with various clinical and pathologic features.

The 20 patients ranged in age from 7 to 40 years with a mean of 20.9 and a median of 21 years. Eighty five percent of patients were before their age of 29 years.

All but one patients sought medical assistance because of lower abdominal mass and/or pain. The only patient presented with vaginal spotting was found to have an ectopic pregnancy in association with an ipsilateral solid teratoma.

Physical examination revealed a large unilateral tumor mass in all patients. Two patients were found to have an associated contralateral smaller cystic tumor mass.

At operation, three cases were found to have peritoneal implantation and one, ovarian torsion.

The size of these tumors varied from 9 to 22 cm in largest diameter. The gross appearance was usually that of a well circumscribed, mostly encapsulated tumor.

On cut sections, the tumors showed a variety of appearance, grey brain tissue, fat sebaceous material, hair, cartilage and bone could be recognized. Infarcts and hemorrhage presented in some cases. All the tumors were either partially cystic or with many small cystic spaces distributed throughout the solid areas.

Slides of all cases were reviewed and graded by a method employed in the Norris' study⁽²⁶⁾, a method originally proposed by Turlbeck and Scully⁽²⁸⁾ with slight modification. Grade 0, in which all tissues are mature and mitotic activity is rare or

absent. Grade 1 was given to neoplasms with some immaturity but with neuroepithelium absent or limited to a rare low-magnification (x40) field within the tumor, and not more than one focus in any slide. Grade 2 was applied when immaturity and neuroepithelium were present to a greater degree than grade 1, neuroepithelium was common but did not exceed three low-power microscopic fields in any one slide. Grade 3 was made when immaturity and neuroectoderm were prominent, the latter occupying four or more low-magnification microscopic fields within individual sections.

Grading based on the criteria mentioned above was taken place, and 7 cases were graded as 0, 2 as 1, 8 as 2 and 3 as 3.

When immature elements presented in tumors of grade 1, 2 or 3, in most specimens, the predominant embryonal tissue was neural, including neuroepithelium in the form of rosettes and tubules, and areas resembling neuroblastoma. Immature cartilage was also commonly found.

Of all solid teratomas collected in this series, about one-third (7/20) were benign i.e., mature solid teratoma, and two-thirds (13/20) immature solid teratoma which were considered as malignant. In Dr. Scully' experience⁽²⁹⁾, the frequency of mature solid teratoma among all solid teratoma was in the vicinity of 10%, which was low in contrast to this study.

3. Monodermal and highly specialized a. Struma ovarii

Thyroid tissue present in mature cystic teratoma is frequently observed in about 5% to 20% of cases⁽³⁰⁾. Such an

occurrence does not justified a diagnosis of struma ovarii. This term is applied when a teratoma with the thyroid tissue overgrow all other tissue, or with only the thyroid tissue presented.

Struma ovarii is an uncommon entity when this diagnosis is made only if the tumor is composed either entirely or predominantly of thyroid tissue, or if thyroid tissue can be recognized grossly.

In this study, five cases of struma ovarii were collected, all of them fitted the criteria mentioned above. These tumors constituted 1% (5/492) of all benign teratomas. The age of the patients ranged from 29 to 62 years, with four of them were postmenopausal. The oldest patient had a dermoid cyst with epidermoid carcinoma transformation presented in the contralateral ovary. The size of these tumors was moderate. They ranged from 4.5 to 9.5 cm in largest diameter with a mean of 8 cm. All tumors were partly cystic and partly solid.

In all patients, the initial symptoms were abdominal, including abdominal pain and/or abdominal distension with or without a palpable mass.

b. Carcinoids

Primary ovarian carcinoid tumors can be divided into two types; 1. Insular, or islet, carcinoid tumors of midgut origin. 2. Trabecular, carcinoid tumors of hindgut or foregut origin⁽³¹⁾.

70 cases of insular⁽³²⁾ and 20 cases⁽³³⁾ of trabecular carcinoid tumor have been reported, with the former all in patients in the fourth to eighth decades and with the latter, in the third to sixth decades⁽³⁴⁾.

In this series, we encountered only one case of insular carcinoid tumor which occurred in a 82 years old patient.

The patient presented with a lower abdominal mass without pain, and had no association with carcinoid syndrom.

Grossly, the tumor was partly cystic and partly solid and measured 8.5x7x6 cm in size with the solid portion 3x2x2 cm.

Microscopically, the tumor was characterized by a predominant solid and acinar pattern of insular carcinoids. The Masson-Fontana stain for argentaffin granules was positive.

D. Choriocarcinoma

Choriocarcinoma of the ovary is a rare tumor. The chances of the tumor arising in the ovary have been estimated to be 1 in 392,000,000⁽³⁵⁾.

Primary ovarian choriocarcinoma may be gestational or nongestational. The former type may occur as a primary choriocarcinoma associated with an ovarian pregnancy. The latter may arise from a teratoma or from an embryonal rest.

Over 100 cases of pure ovarian choriocarcinoma of germ cell origin have been recorded in the literature⁽³⁶⁾, and at least 50 cases of ovarian germ cell tumors containing choriocarcinoma have been reported⁽³⁷⁾. Most patients were children or young adult, and its occurrence in children has been emphasized.

In this study, we collected only one case of non-gestational ovarian choriocarcinoma, which occurred in a 12 days old baby girl.

She was brought to the medical attention because of hyperbilirubinemia and

a palpable lower abdominal mass was noticed. At operation, a 6x6x5 cm sized tumor was found involving the right ovary. The tumor was nodulated and hemorrhagic. Microscopic picture showed a choriocarcinoma with extensive hemorrhage and necrosis. No other teratomatous elements was demonstrated.

E. *Mixed germ cell tumors*

These are tumors composed of two or more of the types of germ cell neoplasia.

There were 3 such cases in this collections. That accounted for 0.21% (3/1403) of all primary ovarian tumors and 0.55% (3/544) of all germ cell tumors.

One tumor was a mixture of dysgerminoma and choriocarcinoma, the other two were teratoma with endodermal sinus tumor elements. Their ages were 23, 20 and 62 years, respectively. None of them showed bilaterality.

IV. *Soft tissue tumors, not specific to ovary*

Leiomyoma

More than 40 cases of ovarian leiomyoma have been reported in adults, accounting for almost one percent of benign ovarian neoplasms, according to Beck and Latour⁽³⁸⁾.

We encountered 3 cases of ovarian leiomyoma in this study, which constitute 0.26% of all benign ovarian tumors. The patients were at 45, 47 and 55 years of age, respectively. All tumors were left sided.

V. *Metastatic carcinoma in the ovary*

The ovary is a fairly site of metastasis from certain primary malignancies. There

are 52 secondary ovarian carcinomas in this collections. They constituted about 3.6% (52/1455) of all ovarian tumors and approximately 17.5% (52/298) of all ovarian cancers.

The majority (45/52) of the cases were adenocarcinoma with 32 of them showing a histologic picture of "Krukenberg tumor", and the rest were 4 epidermoid carcinoma, 2 choriocarcinoma and 1 lymphoma. Approximately two-thirds of patients were at the age of third and fourth decades and 65% (34/52) in reproductive age period. The youngest patient was at 20 and the oldest, 68 years of age. Bilaterality were seen in 44% (23/52) of cases.

Of the 52 metastatic ovarian neoplasms, 22 were of unknown origin, 12, secondary to stomach; 7, large intestine; 5, uterine cervix; 5, uterine body and 1, breast.

Among the 5 tumors secondary to uterine cervix, one was an adenocarcinoma and 4, epidermoid carcinoma. Regarding the 5 cases originated from the uterine body, 3 were endometrioid carcinoma and 2 choriocarcinoma. The only lymphoma which involved the left ovary as well as the small intestine presented no known primary lymphadenopathy.

DISCUSSION

Analysis of 1455 ovarian tumors diagnosed at this department over a period of 12 years was carried out, partly to determine the relative frequency, the age distribution and the bilaterality of different types of ovarian neoplasm occurred in

Taiwan areas and partly to compare such results with their corresponding data mainly published in the U.S..

Reported data of several rather common ovarian tumors are presented in the following paragraphs for the convenience of comparison with the results of this study.

1. Serous and mucinous tumors

Serous and mucinous tumors are very common ovarian neoplasm^(40,41,42,43). Dockery⁽⁴⁴⁾ states that 15% and 20 to 30% of all ovarian tumors are of the benign serous and benign mucinous tumors, respectively, and their ratio is about 3 to 4. Allan's⁽³⁹⁾ incidence for benign serous type is 20% and for benign mucinous one, 21%, and their ratio is nearly 1 to 1. Novak⁽⁴⁵⁾ also indicates this ratio to be about 1 to 1.

Regarding the malignant forms, the ratio for serous type to mucinous type is close to 3 to 1⁽³⁹⁾.

The bilaterality is more frequently

encountered in serous than in mucinous forms, and is more common in malignant than in benign ones of either tumor^(40,41,42,43).

Figures of our results and from the AFIP fascicle, Tumor of the Ovary and Maldeveloped Gonads by RE Scully (1977), are shown in Table 13 for comparison.

From Table 13, we may find that, in this series, the mucinous tumor is a more common ovarian neoplasm, either in benign or in malignant categories, than the serous one, with a ratio of about 4 to 3. The incidence of the bilaterality of mucinous tumors is higher in benign than in malignant forms.

Regarding the age distribution, there is a similar peak frequency of serous and mucinous tumors in this series, while in the U.S., the former apparently involves a younger patients group than the latter. The population of patients of serous and mucinous tumors are respectively about one and two decades younger in this study

Table 13.

Frequency	% of total		% of all benign		% of all mali- g- nant		Bilaterality	
	ovarian tumors		ovarian tumors		ovarian tumors			
Tumor type	Su	Scully	Su	Scully	Su	Scully	Su	Scully
Serous tumor	20.88%	20-50%	—	—	—	—	—	—
Benign	—	—	21%	20-50%	—	—	8.2%	7-12%
Malignant	—	—	—	—	20%	35-40%	ΔB 28% *M 16%	ΔB 26% *M 66% (2/3)
Mucinous tumor	26.30%	15-25%	—	—	—	—	—	—
Benign	—	—	26%	15-25%	—	—	2.7%	<5%
Malignant	—	—	—	—	27%	6-10%	1.5%	10-20%

ΔB: Borderline malignancy of serous tumor

*M: Malignant serous tumor

than in that reported in the U.S.^(40,43).

2. Adenofibroma and cystadenofibroma

Adenofibroma and cystadenofibroma are classified as mere variants of common epithelial tumors in the WHO classification, and considered as a variant of serous cystadenoma by some authors, however, at our department, we treat them as a separate entity within the common epithelial tumor group.

In Czernobilsky's series⁽⁴⁶⁾, 46.5% of all benign serous tumors of the ovary are cystadenofibroma, their patients' age range from 15 to 65 with a mean of 30.7 years, and 5.8% of their cases are bilateral. Figures of adenofibroma are somewhat different from that of the cystadenofibroma. In Thimonen and Purola series⁽⁴⁷⁾, patients' age range from 23 to 70 years, with 50% of the tumors occurred over the age of 50.

In contrast, our results show that the adenofibroma together with the cystadenofibroma constitute only a small portion of all benign ovarian tumors (1.82%) and of benign serous tumors (7.92%), and the average age of the patients involved by adenofibroma (34 years) is younger than that by cystadenofibroma (45.5 years).

In comparison with our result, the incidence of these tumors in Czernobilsky's series seems rather high. Since most reported data didn't separate such tumors from the serous one, we leave the discussion open for further study on this issue.

3. Endometrioid carcinoma

The reported frequency of this neo-

plasm, next only to serous cystadenocarcinoma, are 10% to 24.4% of primary ovarian adenocarcinoma^(48,49), less than 5% of all ovarian tumors and 15-25% of all ovarian cancers⁽⁵⁰⁾. The mean age of these patients is 53 years⁽¹²⁾, and the bilaterality is seen in approximately 30% of cases⁽⁵⁰⁾.

Among 246 primary ovarian cancers collected this time, there are only 9 of this kind. Such a number of cases makes it a rare tumor in this series. This could be resulted partly from the cultural and/or environmental differences and partly from the strict criteriae that we follow for making such a diagnosis.

In some literatures, endometriosis can be demonstrated in 17% of the cases of endometrioid carcinoma⁽¹²⁾ which also has been reported to be frequently associated with a carcinoma of the uterine corpus is as high as 20% of cases⁽⁴⁸⁾. But in this series, we encountered neither findings.

4. Clear cell carcinoma

Of the clear cell tumor, data from Kurman⁽⁵¹⁾ and Czernobilsky⁽⁵²⁾ show an incidence of 5% and 11% of all ovarian cancers respectively. The mean age of their patients is 54 years, and the bilaterality of their cases is 40%.

One interesting feature regarding the clear cell carcinoma, often mentioned in literatures^(13,51,52) but not found in this study, is the frequent admixture of this cancer with elements from other Müllerian-type neoplasms, especially with endometrioid or serous cystadenocarcinoma.

5. **Brenner tumor**

According to Jondahl et al⁽⁵³⁾, the benign Brenner tumor account for 1.7% of all ovarian neoplasms. They also reported a bilaterality of 6.5%. More than half of their patients are over 50 years old.

Malignant Brenner tumor is a rare tumor. The true incidence of this neoplasm is difficult to establish. Less than 2% of the reported cases are borderline or malignant⁽⁵⁴⁾, which occur in women who are on the average 5 to 10 years older than those with the benign tumor.

The mean age of the patients of borderline malignancy and malignant Brenner tumors is on an average 14.5 years older than that of the patients of benign Brenner tumors in our materials.

Over half of the cases of Brenner tumor, in various series in the literature, have been an incidental and often, microscopic findings. This is also true in one of our cases. That tumor appeared as multiple microscopic foci within a large serous cystadenoma.

The association of Brenner tumors with other cystic neoplasms, especially the mucinous cystadenomas and cystic teratomas, is well known⁽⁵⁵⁾. The only malignant Brenner tumor encountered in this series, is found to be associated with a mucinous cystadenoma.

6. **Adenocarcinoma, undifferentiated**

In the Santesson and Kottmeier series⁽⁸⁾, these neoplasms constitute 4.2% of ovarian cancer and 5.2% of primary malignant epithelial ovarian neoplasms, in our series, the figures are higher, they

are about 12% and 17% respectively. This could be, at least, partly resulted from the fact that we use this diagnosis for any poorly differentiated adenocarcinoma which has difficulty to be placed in a more specific category.

In reported series, the tumor involves both ovaries in 54% of cases, and in this series, in 23% of cases.

7. **Sex cord-stromal tumors**

In the literature, sex cord-stromal tumors, as a group, account for approximately 5% of all ovarian tumors and their malignant forms, for 5-10% of all ovarian cancers⁽⁵⁶⁾.

This category of ovarian neoplasms, except for the fibroma, is a group of rare tumors. If fibromas are excluded, the rest of them would make up only a small fraction of total ovarian new-growths.

Fibroma, the most common benign sex cord-stromal tumor, accounts for 4% of all primary ovarian neoplasms. They occur in both young and old ages, but are most frequent during middle age with an average of 48 years. Less than 10% of the cases are encountered under the age of 30 years⁽⁵⁷⁾.

Granulosa cell tumor constitutes 1-2% of all ovarian tumors and 5-10% of all ovarian cancers. About two-thirds of this tumor occur after menopause and 5% are diagnosed before puberty. This neoplasm is unilateral in over 95% of cases⁽⁵⁸⁾.

The thecoma is only one-third as common as the granulosa cell tumor, accounting for less than one percent of all

ovarian tumors. They are frequently encountered in perimenopausal and postmenopausal patients. Less than 10% of the patients are before the age of 30 years⁽⁵⁹⁾.

Sertoli-Leydig cell tumors are rare and representing not more than 0.2% of all ovarian neoplasms. They occur predominantly in young women, with an average age of 28 years. Less than 5% are in prepubertal girls and slightly over 10% in those beyond the age of 45 years⁽⁷⁶⁾.

8. Cystic teratoma, benign

In the United States, over 20% of all ovarian tumors and 30% of those of the benign forms are dermoid cysts. More than 80% of them are encountered in their reproductive years⁽⁶⁰⁾, and in Malkasian's series, 28.7% of cases have been observed over the age of 50⁽⁶¹⁾. This tumor account for half of the ovarian neoplasms that occur in patients before their age of 20⁽²⁹⁾ and for over two-thirds of those in patients under the age of 15 years⁽⁶²⁾. Bilaterality appears in 7.9-15% of cases⁽⁶³⁾. In this study, the corresponding figures are 34%, 41.5%, 85%, 7.2%, 38.8% and 58.8% respectively, and of bilaterality, 9%.

We find that the dermoid cyst plays a very important role in the gynecologic pathology at this department. This tumor is the most common benign tumor in children and in women during their reproductive ages and ranks the third in frequency in postmenopausal patients. From another prospective, we may say that every 3 ovarian tumors received by this department, one would be a benign cystic teratoma.

9. Malignant cystic teratoma and solid teratoma

Both malignant cystic teratoma and solid teratoma are rare tumors, in literatures and in our collections.

According to the published data, about 2% of dermoid cysts are complicated by the malignant transformation^(61,64), and they account for more than 1% of all ovarian cancers⁽⁶⁵⁾. Regarding the solid teratoma, they have been reported to comprise, 0.65% to 2% of ovarian teratomas and 0.15% to 2% of all ovarian neoplasms⁽⁶⁶⁾.

Previously, we did not clearly discriminate between the malignant and solid teratoma in our diagnosis. In this study, we reviewed all the microslides of these cases and reclassified them into two groups. One is dermoid cyst with malignant transformation and the other solid teratoma with or without immature elements. Nine cases of the former and 20 of the latter are diagnosed accordingly. We find that there are much difference between their age distributions. Dermoid cyst with malignant transformation are usually encountered in older patients group with the mean age of 52 years, while, the solid teratoma, mature and immature as well, in younger patients group with the mean age of 22 years.

Chances of finding a cystic teratoma to be malignant is about 1 in every 55 tumors and of a solid teratoma, 2 in 3.

10. Struma ovarii

This rare neoplasm comprises 2.7% of ovarian teratomas⁽⁶⁷⁾. The age incidence

of patients with struma ovarii is generally the same as that of patients with benign cystic teratoma.

11. Dysgerminoma and endodermal sinus tumor

Dysgerminoma constitutes approximately 1% of primary ovarian neoplasms and 5-10% of all primary ovarian cancers (68). The age of the patients range from 6 to 52 years, with most of them (80%) less than 30 years of age⁽⁶⁹⁾.

Over 150 cases of endodermal sinus tumor have been reported, most of them occur in women during their second and third decades⁽⁷⁵⁾.

12. Metastatic carcinoma in the ovary

The relative frequency of secondary ovarian tumor is difficult to establish, which has varied from one country to another. The result could be high as 40% of all ovarian cancers in one series from Japan, or low as 3% in Uganda⁽⁷⁰⁾. Data in one series from the U.S., and in this study are in between, they are 10%⁽⁷¹⁾ and 17.5% respectively. The recorded bilateral involvement in metastatic ovarian carcinomas is 70-90%^(72,73). Figure is lower in this report which shows only 44% bilaterality.

It is generally agreed that adenocarcinoma of the uterine body, the G-I tract and the breasts are the most important neoplasms to be associated with a metastatic ovarian malignancy⁽⁷⁴⁾. In this series, we find that more than 86% of the metastatic ovarian cancers are adenocarcinoma and over two-thirds of which belong to the category of Krukenberg tumor. The most

common primary site is the stomach, followed by the uterus and the large intestine.

SUMMARY AND CONCLUSION

Over a period of 12 years, 1973 through 1984, a total of 1455 ovarian tumors have been collected at this department. Among these tumors, 1157 (79.52%) are benign, 246 (16.91%) malignant and 52 (3.57%) metastatic. More than one half (53.31%) of all the primary neoplasms fall into the category of common epithelial tumors, which is followed in decreasing frequency by the germ cell tumors (38.78%), the sex cord-stromal tumors (7.70%), and the soft tissue tumors, not specific to ovary (0.21%).

The percentage of several frequent and infrequent primary ovarian newgrowths are as follow: dermoid cyst, 34%, mucinous tumors, 26.30% (benign 21.60%; malignant 4.70%), serous tumors, 20.88% (benign 17.39%, malignant 3.49%), fibroma 5.27%, undifferentiated adenocarcinoma 2.14%, solid teratoma 1.43%, granulosa cell tumor 1.35%, clear cell carcinoma 1.21%, endodermal sinus tumor 0.93%, dysgerminoma 0.86%, thecoma 0.86%, endometrioid carcinoma 0.64%, Brenner tumor 0.64%, dermoid cyst with malignant transformation 0.64% and struma ovarii 0.36%. The rest of the ovarian tumors not mentioned above, are only very occasionally or not at all encountered at this laboratory.

Seventy percent (981/1395) of all primary ovarian neoplasms have been encountered in patients during their reproductive years (age 15 to 45), nearly 2.5%

(34/1395) in children and more than 27% (380/1395) in postmenopausal women. A peak incidence has been noticed in second and third decades. Among all primary benign ovarian newgrowths, three-fourths of them occurred in patients before the age of 45 years, while of malignant forms, 45% of them in women beyond that age. From another perspective, the chance of a primary ovarian tumor to be malignant in a patient under 45 years of age is approximately 1 in 7½ and will become 1 in 3½ when beyond that age.

The majority (26/34) of the ovarian tumors developed in children are benign one, and most of which (20/26) are dermoid cyst. Malignant ovarian lesions are rare in children, they comprise about 3% (8/246) of total primary ovarian malignancies. Seventy five percent (6/8) of them belong to germ cell tumors group, with the immature solid teratoma to be the most common one.

We also noticed a different pattern of tumor frequency in patients with age of 15 to 19 years. Ovarian tumors found in this age group, constitute 4.59% (64/1395) of all ovarian neoplasms. Among them, about 79% (51/64) are benign and 21% (13/64) malignant. The most common benign neoplasm is mucinous cystadenoma followed by dermoid cyst and the most common malignant one is borderline malignancy of mucinous tumor with dysgerminoma closely next to it.

In our material, 6% of the common epithelial group of neoplasms occurred in children and adolescents. They comprise 42.86% of neoplasms in patients under 19

years of age. All, but one, of them are mucinous and serous type with a ratio for the former to the latter of 4 to 1. The only tumor of other cell type that we have encountered has been a clear cell carcinoma.

Regarding the postmenopausal women, nearly 30% (111/380) of all ovarian tumor occurred in them are malignant ones. The most common neoplasm, benign as well as malignant, is mucinous type of tumor closely followed by serous one. They together account for 58% (222/380) of all ovarian tumors encountered in this age group, and their malignant form make up nearly half (53/111) of total postmenopausal ovarian cancers.

Fifty two cases of secondary ovarian cancer have been collected, and the majority of them are adenocarcinoma. About 42% of all cases are of unknown origin. The most common known primary site is stomach. The primary carcinoma of large intestine, uterine corpus and cervix and breasts are also being the sources of these metastatic carcinoma in ovary. Nearly 62% of all secondary ovarian tumors are Krukenberg tumor.

A comparison of the data in this series with that published in the U.S. is made, and we find that, in general, the results regarding the frequency, bilaterality and age distribution of ovarian tumors are, more or less, comparable. Usually, if it is a common ovarian tumor in Taiwan, most of the time, it would be also a common one in the U.S.. This is true as well, concerning the bilaterality and age distribution. When a tumor tends to occur in patients of certain age groups and/or likes to involve

both ovaries in this study, very often it will do the same as in studies conducted in the U.S..

Nevertheless there are still some statistic differences between this study and studies performed in the U.S. worth mentioning here. In the U.S., the common epithelial tumors may account for about two-thirds of all primary ovarian tumors and their malignant form for almost 90% of all ovarian cancers⁽¹⁷⁾, whereas our material reveals the corresponding data of 53.31% and 70% (173/246), respectively. Allan⁽³⁹⁾ indicates, a ratio for malignant serous to malignant mucinous tumors of 3 to 1, and Barzilai's⁽⁷⁴⁾ figure for this ratio is 2½ to 1. By contrast, we obtain a reversed ratio of these two tumors of about 3 to 4. This discrepancy may be partly resulted from epidemiologic differences and partly from the fact that we have all poorly differentiated adenocarcinoma diagnosed as undifferentiated adenocarcinoma instead of putting them in the serous tumor category. In the U.S., malignant serous tumor is the most common ovarian cancers, while in this study, mucinous one is the case. In the U.S., the most frequently encountered ovarian neoplasm is either the serous or the mucinous tumor, but in this study, dermoid cyst comes first as a common ovarian newgrowth.

In general, the overall incidence of bilaterality of primary and secondary ovarian tumors in this series is lower than that reported in the U.S., Malignant mucinous tumor and metastatic carcinoma are two striking examples, our data of bilaterality of the former is 1.5% and of the

latter, 44%. In contrast, figures recorded in the U.S. are 10-20% and 70-90% respectively. The difference of these results may partly be explained by that in Taiwan, some surgeons might fail to have a habit of checking the opposite ovary carefully when remove an ovarian tumor.

Ovarian tumor is clinically an important neoplasm in the female population of this country. Although the overall incidence of this tumor in Taiwan areas is lower than that of the western countries, they still constitute a considerable proportion of surgical materials in the pathology departments in Taiwan.

Sources of the surgical specimen received by this department are varied. They come from many local clinics and hospitals distributed throughout this province. Such a nature of the specimen source may hinder certain kinds of study, like case follow-up, but do make the statistic data be more representative of the Taiwan region.

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1455個卵巢腫瘤之組織學研討

蘇順景 陳定堯

我們從台北醫學院病理學科過去十二年間，民國六十二年至七十三年，所有外科病理標本中總共收集了1455個卵巢腫瘤。其中1157個（79.52%）為良性腫瘤，246個（16.91%）為惡性而52個（3.57%）為轉移癌。

在所有原發性卵巢腫瘤中，53.31%屬於常見上皮腫瘤，38.78%屬於生殖細胞腫瘤，7.7%則屬於性索間質腫瘤及0.21%為非專屬於卵巢之軟組織腫瘤。

從數據上，我們發現在本學科中所最常見的卵巢腫瘤乃是皮樣囊腫，佔了所有原發性卵巢腫瘤之34%，其次為粘液性腫瘤（良性21.6%；惡性4.7%）及漿液性腫瘤（良性17.39%；惡性3.49%）。若單論及惡性卵巢腫瘤，則最常遇到的是粘液性囊腺癌（含臨界惡性型），次為漿液性囊腺癌再次則為未分化腺癌。

百分之七十的原發性卵巢腫瘤發生於生殖年齡層之婦女，百分之二十七於停經期及停經後之婦女而約百分之二點五則於小孩。

四分之三之良性卵巢腫瘤發現於45歲前之病人，而45%的惡性卵巢腫瘤則發現於45歲後之病人。換一個說法，當原發性卵巢腫瘤發生時，若病人小於45歲則此腫瘤為惡性的機率為1比7½，而當病人大於45歲時則此機率升為1比3½。

大部份發生於小孩的卵巢腫瘤屬於良性，其中亦以皮樣囊腫佔多數。只有少數（約3%）的原發性惡性卵巢腫瘤發生於小孩，最常見的是實質性畸胎腫。

在15至19歲之間的病人群當中，79%的原發性卵巢腫瘤為良性，21%為惡性。最常發生之腫瘤類別，良性的為粘液性囊腺瘤，次之為皮樣囊腫而惡性的則為臨界惡性粘液性囊腺瘤，次為惡性胚細胞瘤。

發生於45歲後年齡層婦女之卵巢腫瘤，近於30%為惡性。最常遇見的乃是粘液性囊腺瘤及囊腺癌分別於良性和惡性腫瘤群中，而漿液性囊腺瘤及囊腺癌則各佔第二位。

52個轉移癌中，45個為腺癌，4個表皮樣癌，2個絨毛膜癌及一個惡性淋巴瘤。原發性來源不明之轉移癌有22個，而已知之原發性來源以胃為最多，其次為子宮再次為大腸。

以此次收集上所得的資料和國外，特別是美國，已發表之數據相比較，在不同卵巢腫瘤的發生率，其年齡層之分佈及兩側性上，我們發現大致說來，是可類比的。也就是說，在我們學科中較常見的卵巢腫瘤在美國亦然，而特定的卵巢腫瘤也同樣較易發生於相近之年齡層，相同卵巢腫瘤之兩側性亦往往類似。而在一些相異點上，值得提的是，在美國最常見的良性卵巢腫瘤為粘液性囊腺瘤或漿液性囊腺瘤，而惡性的為漿液性囊腺癌。我們的統計資料則顯示，最多的良性卵巢腫瘤為皮樣囊腫，最多的惡性卵巢腫瘤為粘液性囊腺癌。