



Lecture 2: Ovarian Cysts and Ovarian Tumors



MED437
KING SAUD UNIVERSITY

Objectives:

- The pathology of the major types of ovarian cysts (follicular and luteal)
- The classification and pathology of common ovarian tumors including surface epithelial, germ cell, stromal, and metastatic neoplasms

Pathoma Overview

OVARY

1. BASIC PRINCIPLES

- a. The functional unit of the ovary is the follicle.
- b. A follicle consists of an oocyte surrounded by granulosa and theca cells
 - i. LH acts on theca cells to induce androgen production.
 - ii. FSH stimulates granulosa cells to convert androgen to estradiol (drives the proliferative phase of the endometrial cycle).
 - iii. Estradiol surge induces an LH surge, which leads to ovulation (marking the beginning of the secretory phase of the endometrial cycle).
- c. After ovulation, the residual follicle becomes a corpus luteum, which primarily secretes progesterone (drives the secretory phase which prepares the endometrium for a possible pregnancy).
 - i. Hemorrhage into a corpus luteum can result in a hemorrhagic corpus luteal cyst, especially during early pregnancy.
- d. Degeneration of follicles results in follicular cysts. Small numbers of follicular cysts are common in women and have no clinical significance.

2. POLYCYSTIC OVARIAN DISEASE (PCOD)

- a. Multiple ovarian follicular cysts due to hormone imbalance
 - i. Affects roughly 5% of women of reproductive age
- b. Characterized by increased LH and low FSH (LH:FSH > 2)
 - i. Increased LH induces excess androgen production (from theca cells) resulting in hirsutism (excess hair in a male distribution).
 - ii. Androgen is converted to estrone in adipose tissue.
 1. Estrone feedback decreases FSH resulting in cystic degeneration of follicles.
 2. High levels of circulating estrone increase risk for endometrial carcinoma.
- c. Classic presentation is an obese young woman with infertility, oligomenorrhea, and hirsutism; some patients have insulin resistance and may develop type 2 diabetes mellitus 10-15 years later.

OVARIANTUMORS

1. BASIC PRINCIPLES

- a. Ovary is composed of three cell types: surface epithelium, germ cells, and sex cord-stroma.
- b. Tumor can arise from any of these cell types or from metastases.

2. SURFACE EPITHELIAL TUMORS

- a. Most common type of ovarian tumor (70% of cases)
- b. Derived from coelomic epithelium that lines the ovary; coelomic epithelium embryologically produces the epithelial lining of the fallopian tube (serous cells), endometrium, and endocervix (mucinous cells).
- c. The two most common subtypes of surface epithelial tumors are serous and mucinous; both are usually cystic.
 - i. Serous tumors are full of watery fluid.
 - ii. Mucinous tumors are full of mucus-like fluid.
- d. Mucinous and serous tumors can be benign, borderline, or malignant.
 - i. Benign tumors (cystadenomas) are composed of a single cyst with a simple, flat lining most commonly arise in premenopausal women (30- 40 years old)
 - ii. Malignant tumors (cystadenocarcinomas) are composed of complex cysts with a thick, shaggy lining; most commonly arise in postmenopausal women (60-70 years old)
 - iii. Borderline tumors have features in between benign and malignant tumors.
 1. Better prognosis than clearly malignant tumors, but still carry metastatic potential
 - iv. BRCA1 mutation carriers have an increased risk for serous carcinoma of the ovary and fallopian tube.
 1. BRCA1 carriers often elect to have a prophylactic salpingo-oophorectomy (along with prophylactic mastectomy due to the increased risk for breast cancer).
- e. Less common subtypes of surface epithelial tumors include endometrioid and Brenner tumor.
 - i. Endometrioid tumors are composed of endometrial-like glands and are usually malignant.
 1. May arise from endometriosis
 2. 15% of endometrioid carcinomas of the ovary are associated with an independent endometrial carcinoma (endometrioid type).
 - ii. Brenner tumors are composed of bladder-like epithelium and are usually benign.
- f. Surface tumors clinically present late with vague abdominal symptoms (pain and fullness) or signs of compression (urinary frequency).
 - i. Prognosis is generally poor for surface epithelial carcinoma (worst prognosis of female genital tract cancers).
 - ii. Epithelial carcinomas tend to spread locally, especially to the peritoneum.

OVARIAN TUMORS

1. SURFACE EPITHELIAL TUMORS

- g. CA-125 is a useful serum marker to monitor treatment response and screen for recurrence.

1. GERM CELL TUMORS

- a. 2nd most common type of ovarian tumor (15% of cases)
- b. Usually occur in women of reproductive age
- c. Tumor subtypes mimic tissues normally produced by germ cells.
 - i. Fetal tissue-cystic teratoma and embryonal carcinoma
 - ii. Oocytes-dysgerminoma
 - iii. Yolk sac-endodermal sinus tumor
 - iv. Placental tissue-choriocarcinoma
- d. Cystic teratoma
 - i. Cystic tumor composed of fetal tissue derived from two or three embryologic layers (e.g., skin, hair, bone, cartilage, gut, and thyroid)
 - 1. Most common germ cell tumor in females; bilateral in 10% of cases
 - ii. Benign, but presence of immature tissue (usually neural) or somatic malignancy (usually squamous cell carcinoma of skin) indicates malignant potential.
 - iii. Struma ovarii is a teratoma composed primarily of thyroid tissue.
- e. Dysgerminoma
 - i. Tumor composed of large cells with clear cytoplasm and central nuclei (resemble oocyte); most common malignant germ cell tumor
 - ii. Testicular counterpart is called seminoma, which is a relatively common germ cell tumor in males.
 - iii. Good prognosis; responds to radiotherapy
 - iv. Serum LDH may be elevated.
- f. Endodermal sinus tumor
 - i. Malignant tumor that mimics the yolk sac; most common germ cell tumor in children
 - ii. Serum AFP is often elevated.
 - iii. Schiller-Duval bodies (glomerulus-like structures) are classically seen on histology.
- g. Choriocarcinoma
 - i. Malignant tumor composed of trophoblasts and syncytiotrophoblasts; mimics placental tissue, but villi are absent
 - ii. Small, hemorrhagic tumor with early hematogenous spread
 - iii. High P-hCG is characteristic (produced by syncytiotrophoblasts); may lead to thecal cysts in the ovary
 - iv. Poor response to chemotherapy
- h. Embryonal carcinoma
 - i. Malignant tumor composed of large primitive cells
 - j. Aggressive with early metastasis

OVARIAN TUMORS

1. SEX CORD-STROMAL TUMORS

- a. Tumors that resemble sex cord-stromal tissues of the ovary
- b. Granulosa-theca cell tumor
 - i. Neoplastic proliferation of granulosa and theca cells
 - ii. Often produces estrogen; presents with signs of estrogen excess
 1. Prior to puberty-precocious puberty
 2. Reproductive age-menorrhagia or metrorrhagia
 3. Postmenopause (most common setting for granulosa-theca cell tumors)-endometrial hyperplasia with postmenopausal uterine bleeding
 - iii. Malignant, but minimal risk for metastasis
- c. Sertoli-Leydig cell tumor
 - i. Composed of Sertoli cells that form tubules and Leydig cells (between tubules) with characteristic Reinke crystals
 - ii. May produce androgen; associated with hirsutism and virilization
- d. Fibroma
 - i. Benign tumor of fibroblasts
 - ii. Associated with pleural effusions and ascites (Meigs syndrome); syndrome resolves with removal of tumor.

2. METASTASIS

- a. Krukenberg tumor is a metastatic mucinous tumor that involves both ovaries; most commonly due to metastatic gastric carcinoma (diffuse type)
 - i. Bilaterality helps distinguish metastases from primary mucinous carcinoma of the ovary, which is usually unilateral.
- b. Pseudomyxoma peritonei is massive amounts of mucus in the peritoneum.
 - i. Due to a mucinous tumor of the appendix, usually with metastasis to the ovary

Simplified classification of primary ovarian tumors

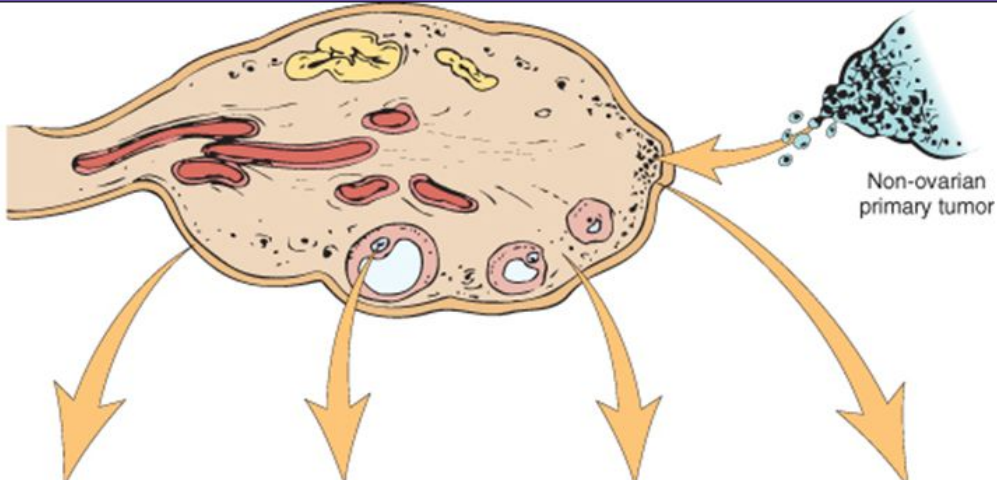
Surface Epithelial Tumors	
Serous tumors (most common)	Benign (cystadenoma) (most common tumor overall)
	Borderline tumors (serous borderline tumor)
	Malignant (serous adenocarcinoma) (most common malignant tumor)
Mucinous tumors	Benign (cystadenoma)
	Borderline tumors (mucinous borderline tumor)
	Malignant (mucinous adenocarcinoma)
Endometrioid tumors	Benign (cystadenoma)
	Borderline tumors (endometrioid borderline tumor)
	Malignant (endometrioid adenocarcinoma)
Clear cell tumors	Benign
	Borderline tumors
	Malignant (clear cell adenocarcinoma)
Transitional cell tumors	Brenner tumor
	Brenner tumor of borderline malignancy
	Malignant Brenner tumor
	Transitional cell carcinoma (non-Brenner type)

Sex cord stromal tumors	
Almost always benign	Fibromas/Fibrothecomas/Thecomas
With malignant potential	Granulosa cell tumors (estrogen producing)
	Sertoli-Leydig cell tumors (Androgen producing)

Simplified classification of primary ovarian tumors

Germ cell tumors (can occur in ovaries or testes)	
Teratoma	Immature (malignant)
	Mature (benign) [can either be solid or cystic (dermoid cyst)]
	Monodermal (e.g. struma ovarii, carcinoid)
Dysgerminoma	
Yolk sac tumor (endodermal sinus tumor)	
Choriocarcinoma (very malignant)	
Embryonal carcinoma	
Mixed germ cell tumors	

Note: all ovarian GCTs are considered as malignant except mature teratoma



ORIGIN	SURFACE EPITHELIAL CELLS (Surface epithelial–stromal cell tumors)	GERM CELL	SEX CORD–STROMA	METASTASIS TO OVARIES
Overall frequency	65%-70%	15%-20%	5%-10%	5%
Proportion of malignant ovarian tumors	90%	3%-5%	2%-3%	5%
Age group affected	20+ years	0-25+ years	All ages	Variable
Types	<ul style="list-style-type: none"> • Serous tumor • Mucinous tumor • Endometrioid tumor • Clear cell tumor • Brenner tumor • Cystadenofibroma 	<ul style="list-style-type: none"> • Teratoma • Dysgerminoma • Endodermal sinus tumor • Choriocarcinoma 	<ul style="list-style-type: none"> • Fibroma • Granulosa–theca cell tumor • Sertoli–Leydig cell tumor 	

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Ovarian Cysts and Tumors

- **Non neoplastic cysts** are common but they are **not** serious problems.
- Inflammation of ovaries is **rare**. It is usually associated with salpingitis of fallopian tubes (salpingo-oophoritis).
“Inflammation of the fallopian tubes”
- Frequently, the ovaries are affected by **endometriosis**. (بطانة الرحم المهاجرة: gland+stroma of endometrium in abnormal site)
- The most important medical problem of ovaries are neoplasms.
- Death from ovarian cancers is more common than that of cervical and uterine together because ovarian tumors grow silently and are **usually diagnosed late**, which makes them so dangerous.

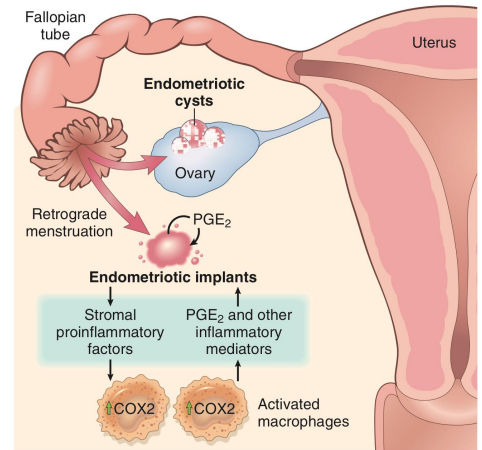


Fig. 19.9 Proposed origins of endometriosis.

Non-Neoplastic Cysts of ovary

Non Neoplastic Cysts are **more common** than neoplastic ones. They usually cause no problems. Non neoplastic cysts **can rupture** and cause **acute pain** and **intra-abdominal hemorrhage**.

non-neoplastic cysts are as follows:

▪ Follicular cyst

Arise from the ovarian follicles and are due to distension of unruptured Graafian follicle.

▪ Corpus luteum cyst

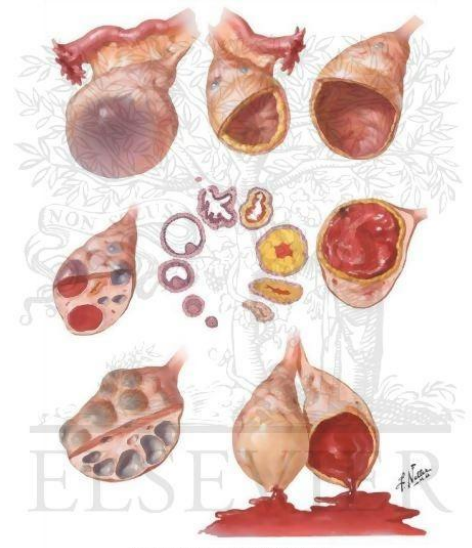
Results from hemorrhage into a persistent mature corpus luteum.

▪ Theca lutein cyst/ hyperreactio luteinalis

Are thin walled cysts lined by luteinized theca cells. They are associated with high levels of circulating gonadotropins (e.g. **pregnancy**, hydatidiform mole, etc).

▪ Chocolate cyst /Endometriotic cyst

The ovary is the most frequent site of endometriosis. And chocolate cyst is a blood filled cyst of the ovary. It is due to **endometriosis** in the ovary with hemorrhage.



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Polycystic ovarian syndrome

- Polycystic ovarian syndrome (formerly called Stein-Leventhal syndrome) is a complex endocrine disorder characterized by hyperandrogenism, menstrual abnormalities, polycystic ovaries, chronic anovulation, and decreased fertility.
- It usually comes to attention after menarche in teenage girls or young adults who present with oligomenorrhea, hirsutism, infertility, and sometimes with obesity.
- The ovaries are usually twice the normal size, graywhite with a smooth outer cortex, and studded with subcortical cysts 0.5 to 1.5 cm in diameter.
- Histologic examination shows a thickened, fibrotic ovarian capsule overlying innumerable cystic follicles lined by granulosa cells with a hyperplastic luteinized theca interna. There is a conspicuous absence of corpora lutea in the ovary

Ovarian Tumors

- One of the leading cause of cancer death in women.
- Ovarian cancers grow silently and go undetected in the early stage when it is still curable. Most of the patients already have metastasis at the time of diagnosis.

Ovarian Tumors: classification

PRIMARY TUMORS

There are **three main primary types** of ovarian tumors based on the origin of the tumor cell. They are:

The WHO Histological Classification for ovarian tumors divides ovarian neoplasms into **primary and metastatic** (secondary).

1. **Surface epithelial ovarian tumors (65%)**: derived from the cells on the surface of the ovary. This is the most common form of primary ovarian cancer and occurs in adults.
2. **Germ cell tumors (15%)**: derived from the egg producing cells of the ovary, i.e. from the ovarian follicles. This occurs mainly in children, teens and young women. They are less common as compared to epithelial ovarian tumors.
3. **Sex cord stromal tumors (10%)**: derived from the ovarian stroma. Uncommon and this class of tumors often produces steroid hormones. These 3 main types are further divided into many subtypes (see later).

METASTATIC/ SECONDARY TUMORS (5%)

Cancers from other organs can also spread to the ovaries.

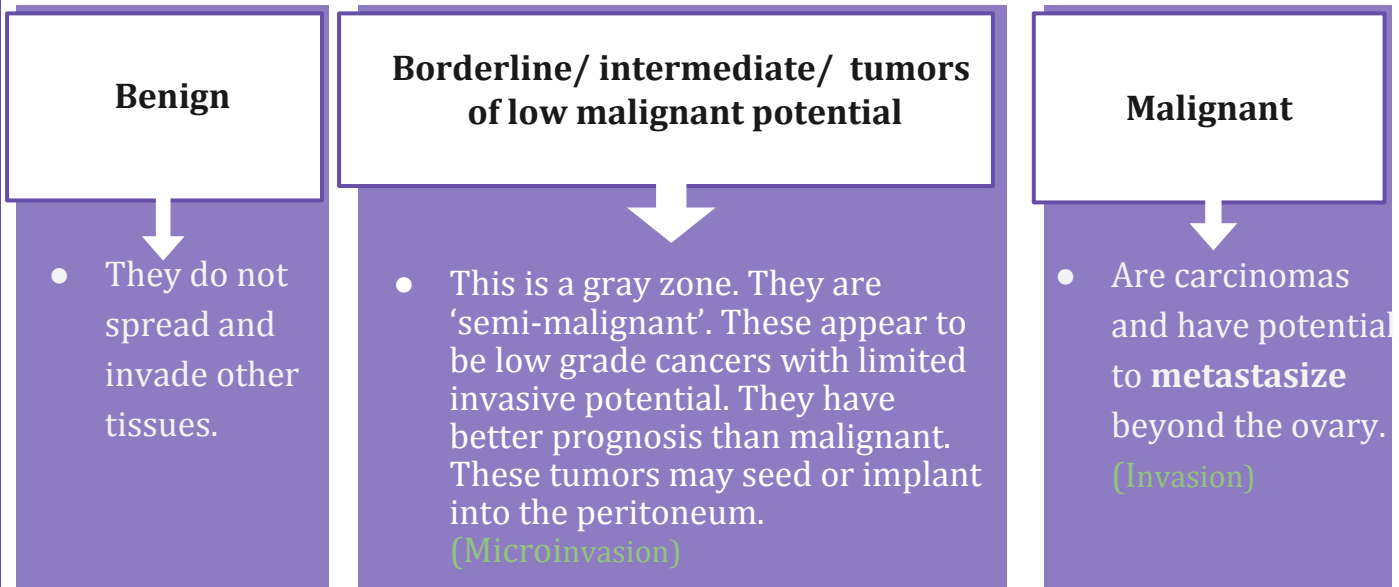
Surface Epithelial Ovarian Tumors (osmosis)

- Neoplasms of surface epithelium account for majority of all primary ovarian tumors.
- Are **65 – 70 %** of overall tumors.
- They account for **90 %** of malignant tumors in the ovary.
- Age 20+

The subtypes of the surface epithelial tumors are

<u>Serous</u> Tumors	<u>Mucinous</u> Tumors	Endometrioid Tumors
Clear cell Tumors	Transitional/Brenner cell Tumors	Others

All surface epithelial tumors are further divided into:



Risk factors (girls slides)

- Nulliparity, family history, and germline mutations in certain tumor suppressor genes.
- Prolonged use of oral contraceptives reduces the risk.
- Around 5% to 10% of ovarian cancers are familial, and most of these are associated with mutations in the BRCA1 or BRCA2 tumor suppressor genes. mutations in BRCA1 and BRCA2 also are associated with hereditary breast cancer.
- The average lifetime risk for ovarian cancer is approximately 30% in BRCA1 carriers; the risk in BRCA2 carriers is somewhat lower.

- Serous ovarian tumors are the most common type of ovarian tumors. They are also the most common group of epithelial tumors. The tumor cells are of serous nature.
- Age is 30 - 40.
- Usually cystic filled with **clear serous fluid**.
- Serous tumors are **often bilateral**. (Metastasized tumors are also bilateral)
- **Psammoma bodies** are commonly seen (More common in malignancy)
- The tumors are subdivided into **benign** (60%), **borderline** (15%) and **malignant** (25%).

Malignant serous tumors (serous cystadenocarcinoma)

- Is the commonest malignant ovarian tumor, forming about a third of all cancers of the ovary.
- The tumors are partly cystic and partly solid with **prominent excrescences**, often with necrosis and hemorrhage.
- These tumors usually present with ascites due to abdominal metastases. Treatment: surgery, chemotherapy and radiotherapy.
- Prognosis; poor.
- cells are markedly atypical, the papillary formations are usually complex and multilayered, and by definition nests or Sheets of malignant cells **invade the ovarian stroma**.

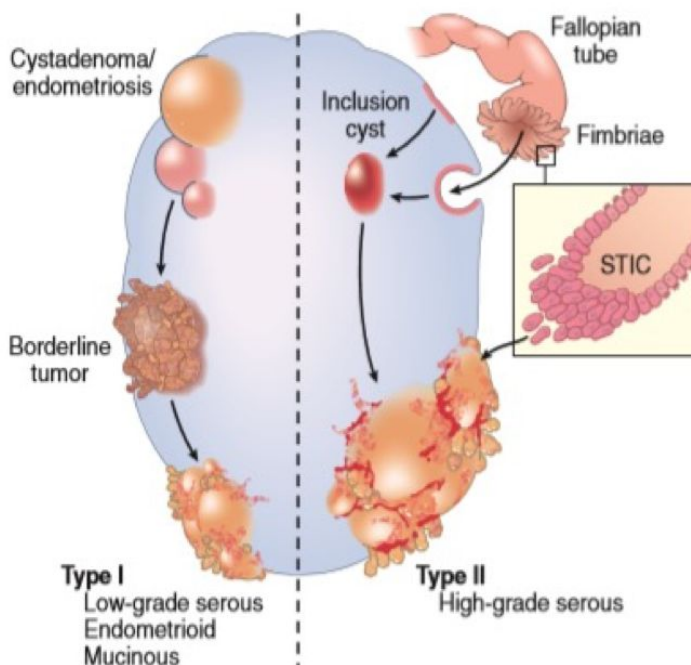
Borderline serous tumors

- Cystic with **thin** wall and smooth surface, but often have **multiple papillary excrescences** (grape-like clusters), protruding into the lumen in places.
- Cytologic atypia with **no stromal invasion**

Benign serous tumors (serous cystadenomas)

- Are commonly **large**, cystic and thin-walled, and **unilocular**.
- They are lined by serous cells and contain thin, clear yellow fluid.
- Single layer of columnar epithelial line the cyst

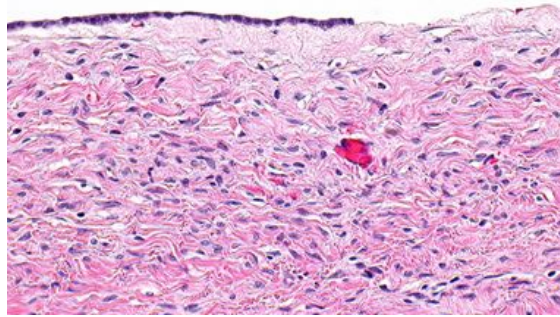
- Serous tumors are the most common of the ovarian epithelial tumors overall, and also make up the greatest fraction of malignant ovarian tumors.
- Benign lesions are usually encountered in patients between 30 and 40 years of age, and malignant serous tumors are more commonly seen between 45 and 65 years of age.
- There are two types of serous carcinomas
 1. Low-grade and high-grade. The former arise from benign or borderline lesions and progress slowly in a stepwise manner to become invasive carcinoma. These low-grade tumors are associated with mutations in genes encoding signaling proteins, such as **KRAS, a member of the RAS gene family.**
 2. High-grade serous tumors develop rapidly. Many of these high-grade lesions arise in the fimbriated end of the fallopian tube via serous tubal intraepithelial carcinoma, rather than ovarian coelomic epithelium.
- **TP53 mutations in high-grade** serous cancers, being present in over 95% of cases.
- Other frequently mutated genes include the tumor suppressors NF1 and RB, as well as BRCA1 and BRCA2 in familial ovarian cancers.



1. Low grade start as benign changes (it could any benign tumors) then progress to border line → low grade
2. High grade start from fimbriated end of the fallopian tube via **serous tubal intraepithelial carcinoma**,

Fig. 19.15 Derivation of various ovarian neoplasms. Type I tumors progress from benign tumors through borderline tumors that may give rise to a low-grade carcinoma. Type II tumors arise from inclusion cysts/fallopian tube epithelium via intraepithelial precursors that are often not identified. They demonstrate high-grade features and are most commonly of serous histology. STIC, serous tubal intraepithelial carcinoma.

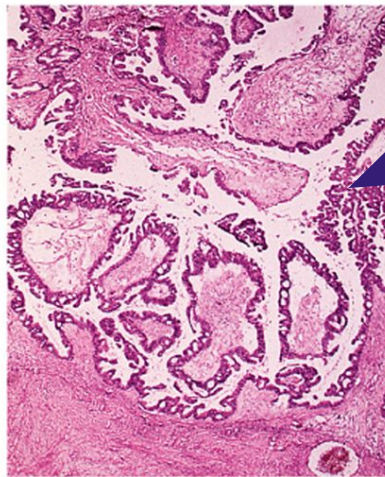
Serous cystadenoma



- Serous
- No invasion
- Cytoplasm is not clear

- Thin wall
- 2 cysts

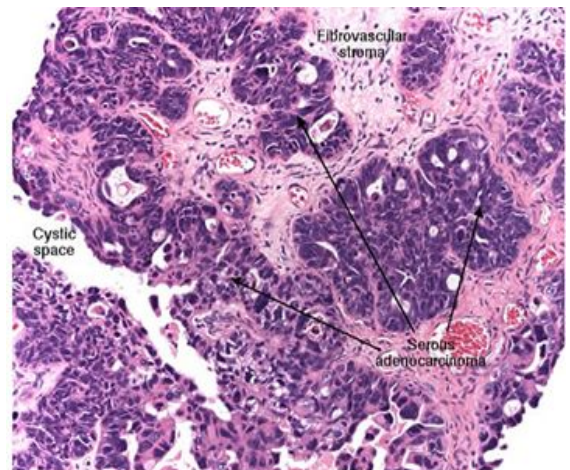
Borderline serous tumor



Finger like projection

- Papillary projection
- No invasion of stroma = borderline

Serous cystadenocarcinoma, ovary



- Cystic but mostly solid

- Columnar mitosis and necrosis
- Infiltration of stroma
- Psammoma bodies

Prognosis of serous tumors (girls slides)

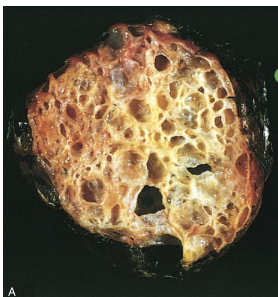
- In general, malignant serous tumors spread throughout the peritoneal cavity and to regional lymph nodes, including periaortic lymph nodes; distant lymphatic and hematogenous metastases are infrequent.
- The prognosis for patients with high-grade serous carcinoma is poor, even after surgery and chemotherapy, and depends heavily on the stage of the disease at diagnosis.

Mucinous Tumors

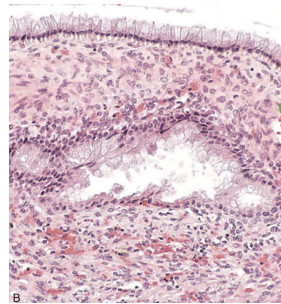
- Form about 25% of all ovarian neoplasms. The tumor cells are **mucin-producing cells** (which are either endocervical type or intestinal type cells).
- Less likely to be malignant than serous tumors.
- 80% are benign, 10% are borderline & **10% malignant**.

Morphology:

- Can be very large, **bilaterality is uncommon** “**unilateral most common**”, typically cystic (multicystic), multilocular and filled with **thick sticky, viscous mucoid fluid**.



• Cystic thin wall



• Clear cytoplasm & mucin pushing nuclei

mucinous tumors are much less likely to be bilateral. This feature is sometimes useful in differentiating mucinous tumors of the ovary from metastatic mucinous adenocarcinoma from a gastrointestinal tract primary (the so-called “Krukenberg tumor”), which more often produces bilateral ovarian masses.

Endometrioid Tumors

- They have a **tubular gland** that **resembles the endometrium** so the name endometrioid (endometrium-like).
- Form 10 to 20% of all ovarian tumors; Most are malignant (carcinomas).
- Some are accompanied by an endometrial carcinoma in the uterus and / or **endometriosis in the ovaries**.

Transitional Cell/ Brenner Tumors

- Tumor cells are transitional cell type
- **Most are benign**

Sex Cord-Stromal tumors (osmosis)

Thecoma-Fibroma:

- Any age; they can be either pure thecomas, pure fibromas or fibrothecomas (mixture of both).
- **Almost always benign**. Very rarely malignant
- About 40% cases are associated with **ascites** and **hydrothorax** called as **Meig's Syndrome**.

Morphology:

- Unilateral
- Pure theca cell tumors produce estrogen
- Fibromas **do not produce estrogen, except** when mixed with thecomas.
- They are solid tumors, vary in color from white to yellow. Fibromas are whiter, harder with **whorled cut surface**.



Granulosa Cell Tumor:

2 forms: adult and juvenile:

1. **Adult form** is more common in **postmenopausal women**.
2. **The juvenile form** is seen the **first 3 decades**, can present **with isosexual precocity**.

Morphology:

- Unilateral, solid and cystic; **Produce estrogen**.
- Can present with abnormal **vaginal bleeding**; & can be associated with **endometrial hyperplasia and carcinoma**. (due to estrogen)
- About 5 to 25% show **malignant** behavior

Sertoli – Leydig cell tumor:

- Rare tumors of **low malignant potential**; **All ages**; Unilateral yellowish solid tumor.
- **Produces androgens** and present with **virilization** in 1/3 of cases (oligomenorrhea, **amenorrhea**, loss of female secondary sex characteristics with hirsutism, clitoromegaly, deepening of voice)

Germ Cell Tumors (osmosis)

Classification of Ovarian Germ Cell Tumors (GCT):

1) **Teratoma:**

- a) Immature
- b) Mature (**benign**)
 - i) Solid
 - ii) Cystic (dermoid cyst)
 - iii) Monodermal (e.g., struma ovarii, carcinoid)

2) **Dysgerminoma**

3) **Yolk sac tumor (endodermal sinus tumor)**

4) **Choriocarcinoma**

5) **Embryonal carcinoma**

6) **Mixed germ cell tumors:** mixture of germ cell tumors occurring together in one tumor mass (More difficult to treat)

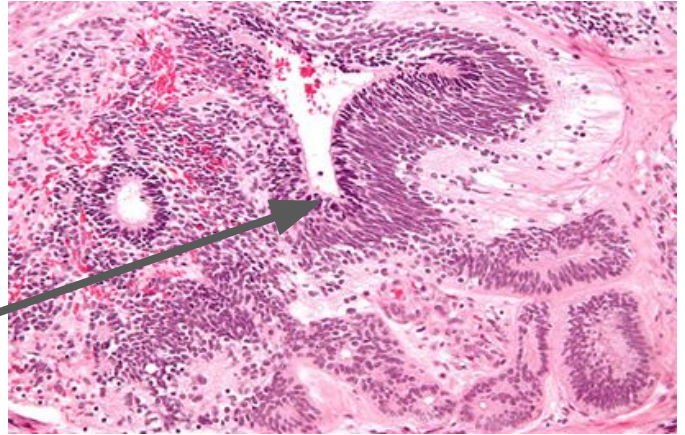
NOTE: All Ovarian GCTs are considered **Malignant** Except Teratoma.

Teratoma

- ❖ Are **15-20 %** of ovarian tumors. Majority occur in the first 2 decades
- ❖ The tumors are subdivided into **mature**, **immature** and **monodermal**.
- ❖ Mature cystic teratoma are the **most common**. They are benign.
- ❖ Immature teratomas are **malignant** and **rare**.
- ❖ The younger the patient, the greater the likelihood of malignant behavior

A- Immature teratoma:

- Malignant neoplasm, occurs in children and young adults.
- Usually **unilateral solid mass**.
- Similar to mature teratoma but in addition they contain immature or embryonal tissues especially **immature neuroepithelial cells**.
- They are graded based on the amount of immature tissue.



Germ Cell Tumors

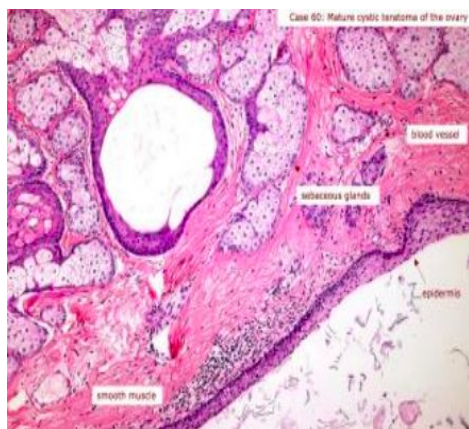
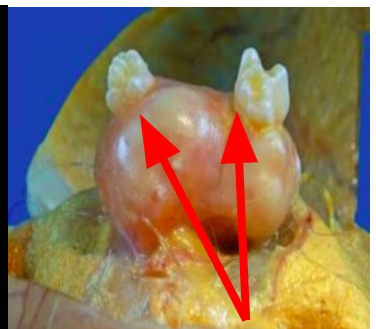
B- Mature Cystic Teratoma:

- ❖ Is the **most common ovarian germ cell tumor** and the **most common type of ovarian teratoma** (The most common **ovarian tumor** is **surface epithelial cell tumors** and the most common **ovarian germ cell tumor: mature cystic teratoma**).
- ❖ It is a **benign** neoplasm that typically occurs during reproductive years composed of mature elements of the **ectoderm**, **endoderm** and **mesoderm**.
- ❖ It is a **cystic** tumor, filled with **sebaceous material** and **hair** and occasionally **teeth**.
- ❖ **Histology: skin, hair, sebaceous glands**, and mature **neural tissue** predominate; cartilage, bone, respiratory and intestinal epithelium are common. (Because they are of mature elements of ectoderm, endoderm and mesoderm they can grow and differentiate to these structures)
- ❖ Complications include: **torsion, rupture (hemorrhage), infection** etc.
- ❖ (The patient usually present young in age with abdominal pain)

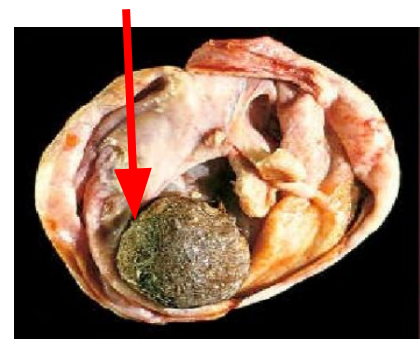
B- Benign (mature) Cystic Teratomas (girls slides)

- Are marked by the presence of mature tissues derived from all three germ cell layers: ectoderm, endoderm, and mesoderm.
- Usually these tumors contain cysts lined by epidermis with adnexal appendages—hence the common designation dermoid cysts.
- Most are discovered in young women as ovarian masses or are found incidentally on abdominal radiographs or scans because they contain foci of calcification produced by toothlike structures contained within the tumor.
- About 90% are unilateral
- On cut section, they often are filled with sebaceous secretion and matted hair that, when removed, reveal a hair-bearing epidermal lining .
- Sometimes there is a nodular projection from which teeth protrude. Occasionally, foci of bone and cartilage, nests of bronchial or gastrointestinal epithelium, or other tissues are present.
- For unknown reasons, these neoplasms sometimes produce infertility and are prone to undergo torsion (in 10%–15% of cases), which constitutes an acute surgical emergency.
- Malignant transformation, usually to a squamous cell carcinoma, is seen in about 1% of cases.

B- Mature cystic teratoma gross & histopathology

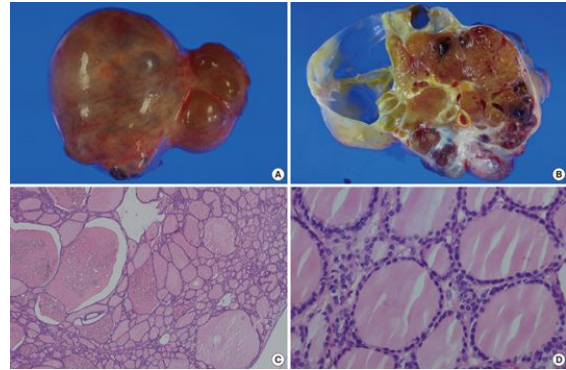


Hair
Tooth



C- Monodermal teratoma:

- Uncommon neoplasm.
- A teratoma composed of one tissue element.
- The most common type of **monodermal** teratoma is called "**struma ovarii**", which is made up of mature **thyroid tissue**.
- The thyroid tissue can sometimes become malignant.
- Sometimes a carcinoid tumor can arise from it. In rare occasions.



Other Germ Cell Tumors

DYSGERMINOMA:

- Uncommon.
- Between 10 to 30 yrs of age.
- Unilateral and solid mass.
- Microscopically look exactly like its counterpart in testis (**Seminoma**) and brain (germinoma).
- **Malignant**.
- **PLAP** positive.
- **Highly sensitive to radiation therapy**.

ENDODERMAL SINUS TUMOR:

- Also known as **yolk sac tumor**.
- Under 30 years of age.
- can be pure or a component of a mixed germ cell tumor .
- is radioresistant but **responds well to chemotherapy**.
- the tumor is associated with elevated serum **alpha-fetoprotein** and alpha-1-antitrypsin.
- Its characteristic histologic feature : **Schiller-Duval** bodies: papillary malignant fibrovascular core
- Positive for immunostain for **alpha-fetoprotein**.

EMBRYONAL CARCINOMA:

- Rare, **aggressive, highly malignant**, radioresistant but responds to chemotherapy.
- Similar to that seen in testis, usually occurs in combination with other GCTs (mixed GCT).
- 2nd and 3rd decade (children and young adults).
- **Unilateral**, solid, hemorrhagic and necrotic.
- **CD 30** immunostain positive.

CHORIOCARCINOMA:

- Rare, aggressive, highly malignant, metastasizes widely through the bloodstream to the lungs, liver, bone etc.
- **Radioresistant AND chemoresistant**.
- Similar to that seen in testis, usually occurs in combination with other GCTs (mixed GCT).
- **elevated serum hCG levels**.
- unilateral, solid, **hemorrhagic** tumor, composed of malignant cytotrophoblast and syncytiotrophoblast.
- **HCG** immunostain positive.
- Necrosis

Metastatic Tumors

- Accounts for approximately 5% of ovarian tumors. (uncommon)
- Older ages, **mostly bilateral** and sometimes very large.
- Primary tumor can be from **Gastro-intestinal tract (most common)**, breast, and lung.
- One of the most classic forms of metastatic carcinoma involving the ovaries is the **Krukenberg tumor**. This tumor is a metastatic carcinoma composed of **signet ring cells** in a fibrous background. The most common sites of origin is the GIT (**stomach, colon, and appendix**).

Teratomas (of ovarian GCTs)

A- Immature Cystic Teratoma

- Malignant, occurs in children and young adults.
- Unilateral and solid.
- contain immature or embryonal tissues especially immature neuroepithelial cells.
- Grading is based on the amount of immature tissue.

B- Mature Cystic Teratoma

- The most common ovarian germ cell tumor** and the most common type of ovarian teratoma
- Benign** (composed of **Ectoderm, Endoderm, Mesoderm**)
- cystic tumor, filled with **sebaceous materia, hair and teeth**.
- Complications include: **torsion, rupture and infection**

C- Monodermal Teratoma

- Composed of **one tissue element**.
- The most common type of monodermal teratoma is called "**struma ovarii**", which is made up of **mature thyroid tissue**.
- The thyroid tissue can sometimes become **malignant**.
- Sometimes a **carcinoid tumor can arise from it**.

Important points (doctor's review)

- What are the examples of sex cord tumors?
 - Fibroma, Thecoma, Fibrothecoma, Granulosa cell tumor
- A serous cystadenoma is **benign**.
- A serous cystadenocarcinoma is **malignant**.
- A fibroma is **benign**.
- A granulosa cell tumor is usually **benign**.
- Yolk salk tumors and choriocarcinomas are usually **malignant**.
- How can you differentiate between a mature cell teratoma and an immature cell teratoma?
 - The presence of **neuroepithelial cells** indicates that the teratoma is immature.
- **Meigs Syndrome**: hydrothorax and ascites associated with sex cord tumors.
- **Krukenberg Tumors**: metastasized tumors of the ovaries with signet ring cells usually from stomach, appendix, or colon.

[Summary video](#)

MCQ

1) Which of the following teratomas is composed of one tissue element?

- A- Mature cystic Teratoma
- B- Immature Cystic Teratoma.
- C- Monodermal Teratoma.
- D- Surface epithelial cell.

2) Which of the following is the most common?

- A- Mature cystic Teratoma
- B- Immature Cystic Teratoma
- C- Monodermal Teratoma
- D- Dysgerminoma

3) A female patient presented to clinic with symptoms of hyperthyroidism, clinical examination reports no goiter. Ultrasound revealed an ovarian mass. What's most likely the diagnosis?

- A- Mature cystic teratoma
- B- Krukenberg tumor
- C- Struma ovarii
- D- Dysgerminoma

4) Which of the following tumors is more common in postmenopausal women?

- A- Serous carcinoma
- B- Endometrioid tumor
- C- Sertoli-Leyding tumor
- D- Granulosa cell tumor

5) A clinical study of women diagnosed with ovarian neoplasms reveals that 1 in 200 develop masculinizing signs and symptoms, including hirsutism, acne, breast atrophy, and amenorrhea. These women are found to have well-circumscribed, lobulated, firm, yellow mass lesions averaging 5 cm. Microscopically they have plump pink cells that show positive immunohistochemical staining for inhibin. Which of the following neoplasms are most likely to have these features?

- A- Brenner tumor
- B- Dysgerminoma
- C- Granulosa-theca cell tumor
- D- Sertoli-Leyding Tumor

Cases

1. A 63 year old lady presents with abdominal mass and weight loss, was diagnosed as having an ovarian tumour.

Q1/ What would be the most common ovarian tumor in this women?

Q2/ Mention 3 subtypes of this tumor?

2. A 24-year-old man presents to his physician with gynecomastia and testicular enlargement. Serum urine and human chorionic gonadotropin (hCG) levels are elevated. Biopsy of the testicular mass reveals a cytotrophoblast and syncytiotrophoblast structure.

Q3/ What is the most likely diagnosis?

Q4/ What is the classification of this tumor?

Answers:

Q1) Surface epithelial ovarian tumor

Q2) Serous, mucinous, endometrioid

Q3) Choriocarcinoma

Q4) Germ Cell Tumor



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