



# A Private Investigation: Radiologic-Pathologic Correlation of Testicular Tumors



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# Disclosure

None of the authors have conflicts of interest to disclose



# Learning Objectives

1. Review sonographic findings of seminoma and nonseminomatous tumors of the testis, as well as less common tumors including lymphoma, epidermoid cyst and gonadal stromal tumor.
2. Direct comparison of sonographic findings with gross and histologic pathology findings.
3. Discuss pearls and pitfalls in accurately diagnosing testicular tumors.

# Testicular Tumors

## ■ Demographics

- 1% of all solid tumors in males.
- Most common male solid tumor malignancy between 15-35 years.
- Most common are germ cell tumors (95%) followed by sex cord-stromal tumors.

## ■ Risk factors

- Cryptorchidism
- History of prior testicular malignancy
- Age (20-34) and ethnicity (Whites)
- Infertility
- Intersex syndrome
- HIV infection
- Family history



# Classification

## ■ Germ-cell tumors

- Seminoma
- Nonseminomatous germ cell tumor (GCT)
  - Pure or mixed malignant GCT (polyembryonal)
    - Embryonal cell
    - Teratoma
    - Yolk sac (endodermal sinus tumor)
    - Choriocarcinoma

## ■ Non Germ-cell tumors

- Leydig (interstitial cell)
- Sertoli (andoblastoma)

## ■ Metastasis

## ■ Lymphoma

## ■ Epidermoid cyst

## ■ Paratesticular tumors

## ■ Mimicks/pitfalls



# Germ Cell Tumors



# Seminoma

## Demographics

- Most common single cell-type tumor and most common tumor in undescended testis
- Age 40-50
- 1-3% bilateral
- Increased hCG
- 25% metastasis at presentation
- Good prognosis
- Spermatocytic subtype: older age group, no symptoms, no tumor marker, no metastasis

## Imaging, pathology and treatment

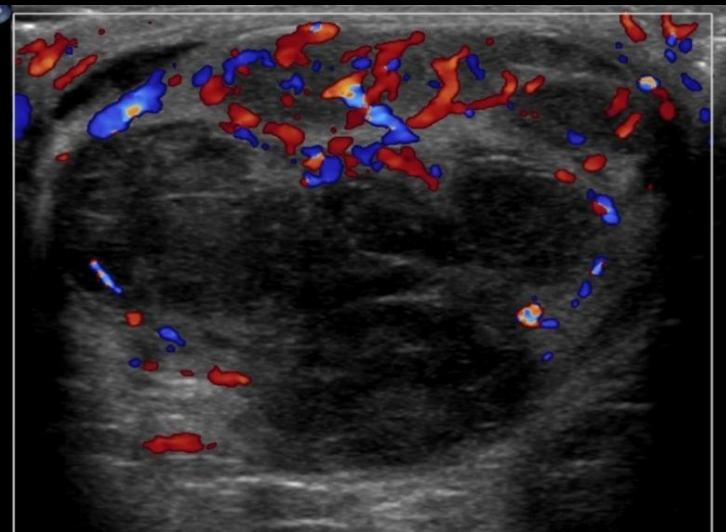
- Well-defined, hypoechoic, solid mass
- Small tumors (<1.5 cm) avascular; larger tumors hypervascular
- May have cystic component
- Calcifications may be present
- Treatment: radiotherapy ± chemotherapy
  - Unless spermatocytic subtype, treatment is orchiectomy

# Seminoma



Imaging: Enlarged left testicle with numerous heterogeneous and hypoechoic nodules and masses with hyperemic intervening parenchyma between the nodules and masses

Pathology: seminoma





# Embryonal Cell Carcinoma

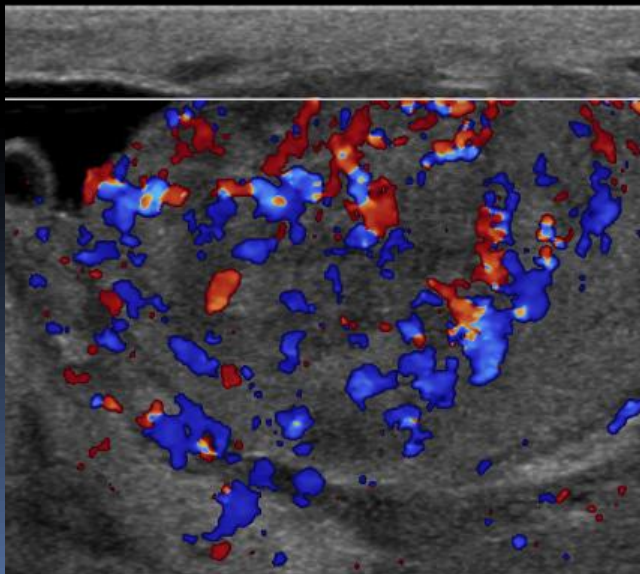
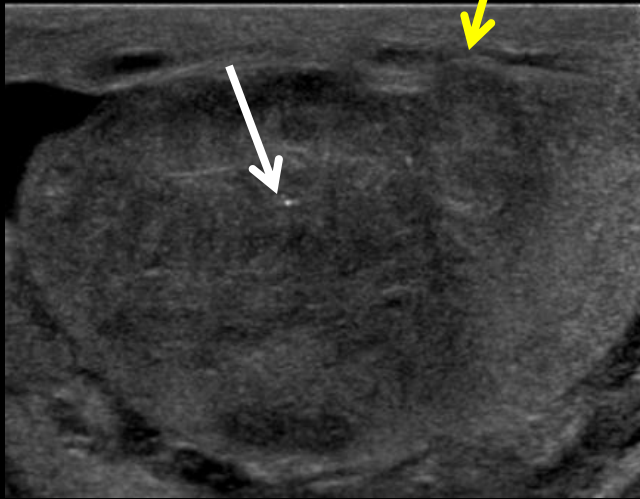
## Demographics

- Pure:
  - Rare, represents 2-3% all testicular tumors
- Mixed:
  - Common, present in 87% mixed germ cell tumors
- 3<sup>rd</sup> and 4<sup>th</sup> decades
- Often small at presentation
- Aggressive

## Imaging and pathology

- Heterogeneous, mostly solid mass
- Poorly defined margins
- May demonstrate necrosis
- +/- coarse calcifications
- Can invade tunica albuginea and cause abnormal testicular contours
- Anaplastic epithelial cells

# Pure GCT, Embryonal Cell Carcinoma Predominant



Imaging: Ill-defined hypoechoic intratesticular mass with coarse and fine calcifications (white arrow) resulting in abnormal contour of the testicle (yellow arrow)

Pathology: Embryonal cell carcinoma, pure (green arrow)



# Teratoma

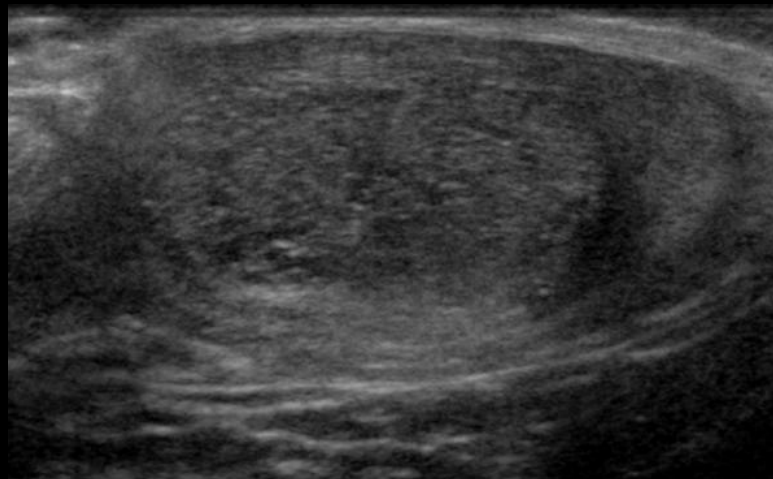
## Demographics

- 4-9% all testicular tumors
- Pure:
  - Very young children (<2 years)
- Mixed:
  - Young adults (3<sup>rd</sup> and 4<sup>th</sup> decade)
- Present as painless testicular mass

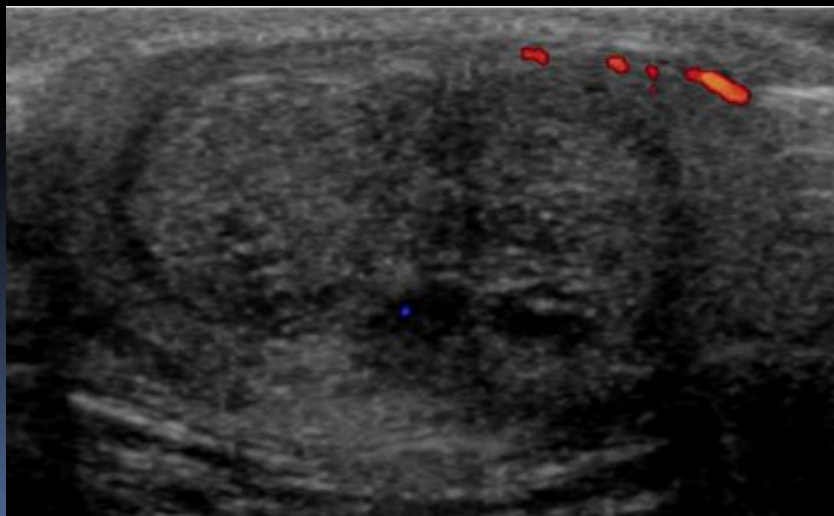
## Imaging, pathology and treatment

- Well-defined anechoic/complex heterogeneous cystic intratesticular mass
- Cystic areas, calcification, and/or fibrosis can suggest teratoma
- May contain mucinous or sebaceous material, hair follicles
- Treatment:
  - Varies depending on stage
  - Surgical → chemotherapy

# Mixed GCT, Teratoma Predominant



Imaging: 2 year old patient with asymmetrically enlarged testicle with painless, firm, heterogeneously hypoechoic testicular mass demonstrating intermittent vascular flow



Pathology (image not available): Malignant GCT, nonseminoma (60% immature teratoma, 40% yolk sac tumor)

# Yolk Sac Tumor (Endodermal Sinus Tumor)

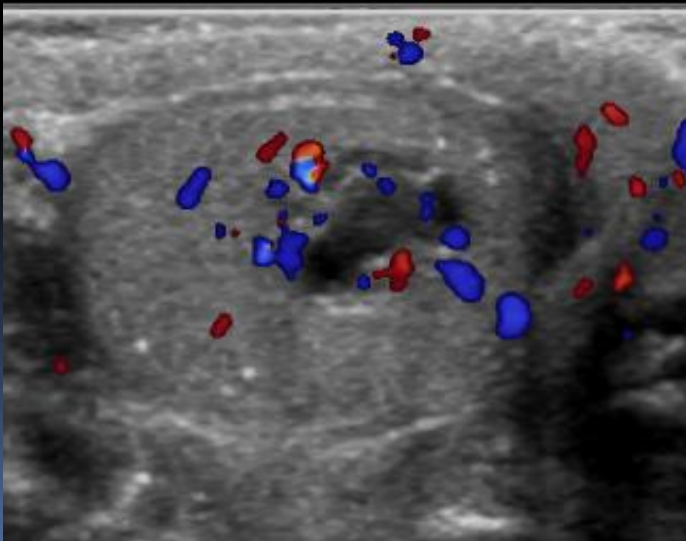
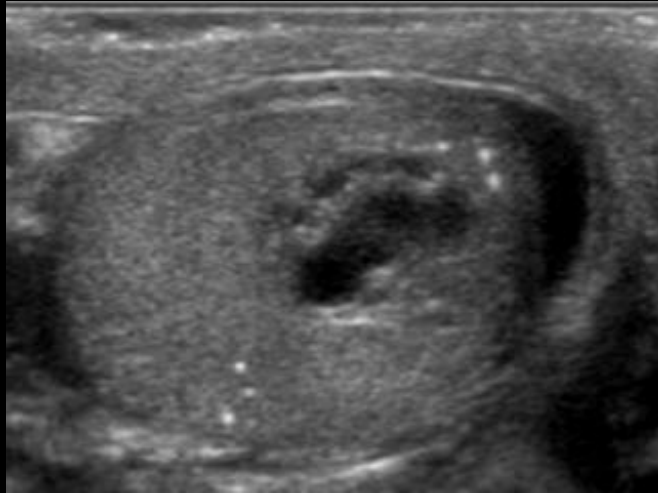
## Demographics

- Common
- 80% childhood testicular tumors
- <2 years
- Pure:
  - Rare in adults
- Mixed:
  - Present in 44% adult cases
- AFP elevated >90%

## Imaging, pathology and treatment

- Nonspecific imaging features
- May only have testicular enlargement without discrete mass
- Totipotential germ cells
- Treatment:
  - Varies depending on stage
  - Often confined to testis at time of orchiectomy
    - If serum AFP is not elevated, orchiectomy may be curative

# Mixed GCT, Yolk Sac Tumor Predominant



Imaging: Asymmetrically enlarged testicle with complex solid and cystic intratesticular mass with vascularity to the solid components in background of microlithiasis

Pathology: Malignant mixed GCT, nonseminomatous (40% yolk sac tumor, 30% embryonal cell carcinoma, 30% immature teratoma with rare syncytiotrophoblasts)

# Choriocarcinoma

## Demographics

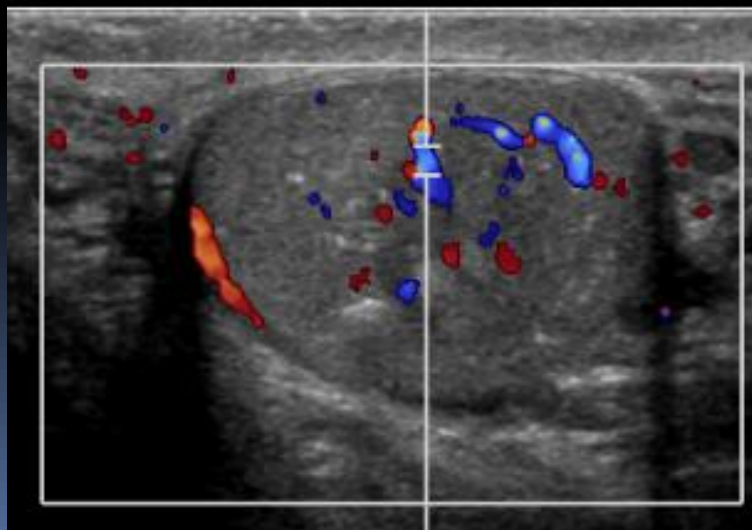
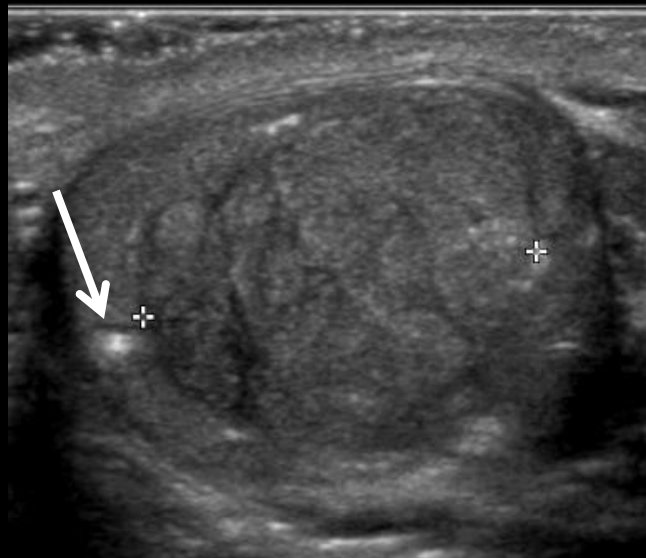
- Rare
- Pure:
  - Represents <1% testicular tumors
- Mixed:
  - Present in 8% mixed germ cell tumors
- Often present with widespread, early metastases
  - Lung, liver, GI tract, brain
- HCG elevated in 10%

## Imaging and treatment

- Heterogeneous solid intratesticular mass
- Commonly with hemorrhage and focal necrosis
- Calcification and cystic necrosis also common
- Metastases also hemorrhagic
- Treatment:
  - Worst prognosis
  - Death usually within 1 year of diagnosis (pure)
  - 5 year survival rate of 48% (mixed)



# Mixed GCT, containing Choriocarcinoma



Imaging: Heterogeneously hypoechoic mass containing coarse and punctate calcifications (white arrow) with increased vascularity

Pathology: Malignant mixed GCT nonseminomatous (40% yolk sac tumor, 30% embryonal carcinoma, 20% immature teratoma, and 10% choriocarcinoma)





# Non-Germ Cell Tumors



# Sertoli Cell Tumor

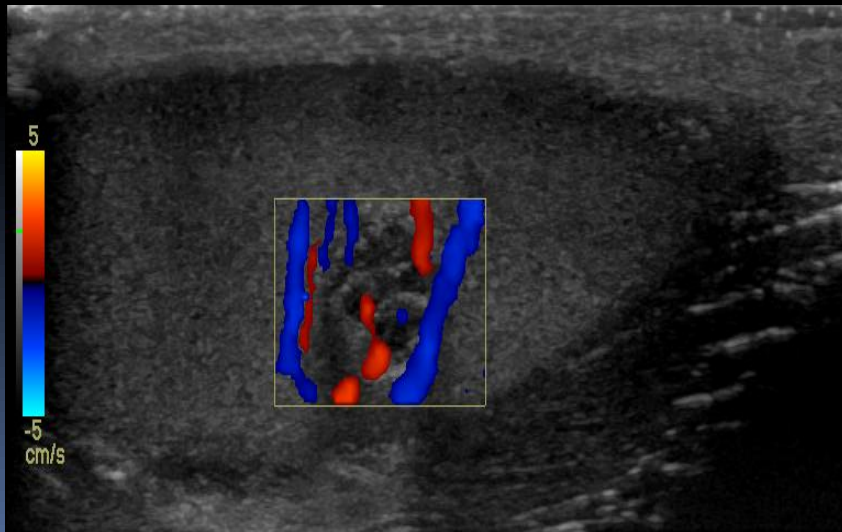
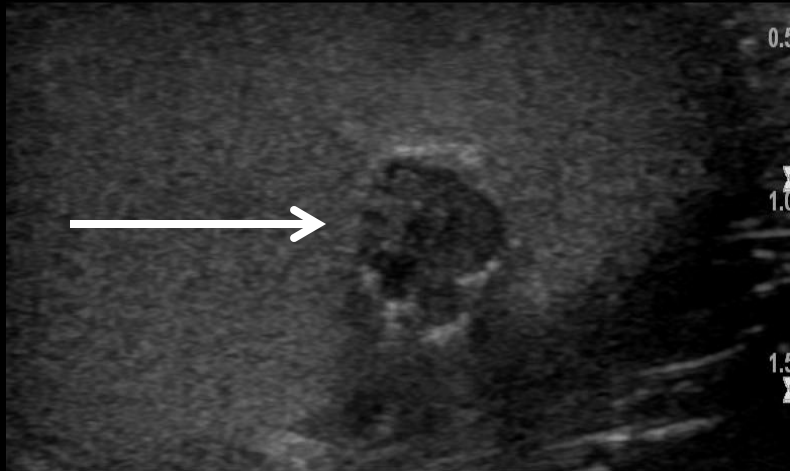
## Demographics

- <1% of testicular tumors
- Mean size: 3.5 cm, majority benign; malignant > 5 cm
- Mean age 45 years; up to 20% occur in childhood
- May produce estrogen/Müllerian inhibiting factor
- Association with Peutz-Jegher or Carney syndromes in younger ages.
- Some bilateral
- Presentation: slowly enlarging testicular mass

## Imaging and treatment

- Solid hypoechoic mass with cystic component +/- punctate calcifications.
- Large calcifications associated with syndromes
- Internal or perinodular flow
- Treatment: orchiectomy

# Sertoli Cell Tumor



Imaging: Small, heterogeneous, hypoechoic, solid lesion involving the lateral aspect of the right testicle with increased color Doppler flow

Pathology: Sertoli cell tumor



# Lymphoma

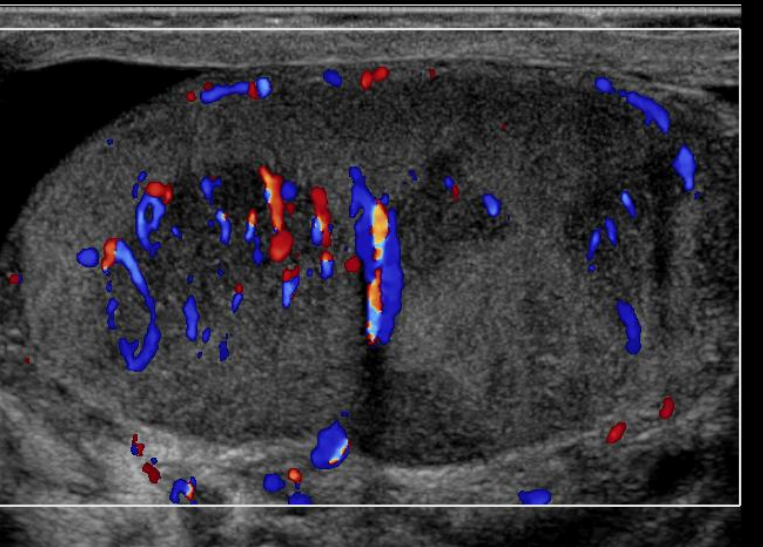
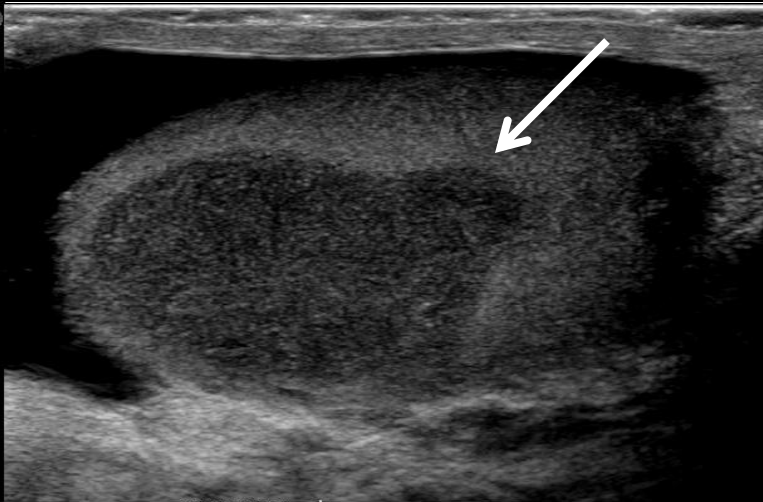
## Demographics

- 5% of testicular tumors
- Most common testicular malignancy in >60 years
- Median age: 66 - 68 years
- Most common bilateral testicular neoplasm
- Presents as firm painless mass
- Constitutional symptoms uncommon. If present, strongly suggests systemic disease

## Imaging, pathology and treatment

- Hypoechoic mass with increased vascularity
- Hydrocele in ~40% of cases
- Involves epididymis and spermatic cord in 1/2 of cases
- Majority are diffuse large B-cell lymphoma
- Treatment: orchiectomy + chemotherapy

# Lymphoma



Imaging: Hypoechoic focal intratesticular masses with high vascularity and associated hydrocele

Pathology: lymphoma

# Epidermoid Cyst

## Demographics

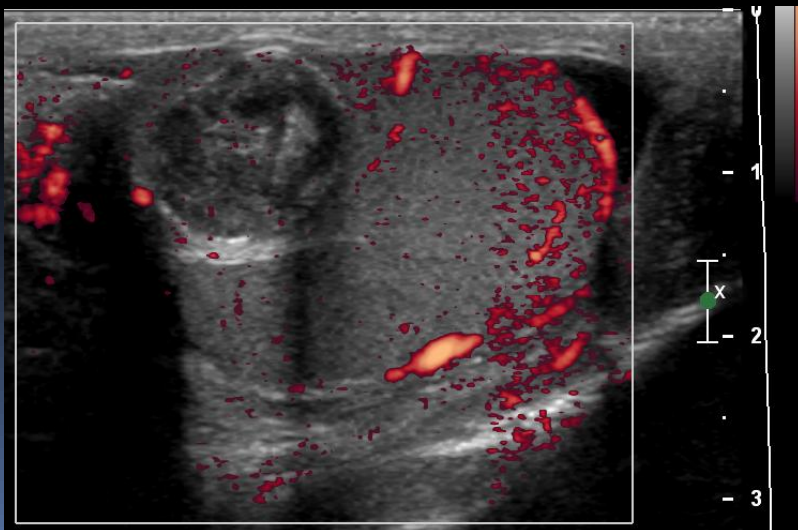
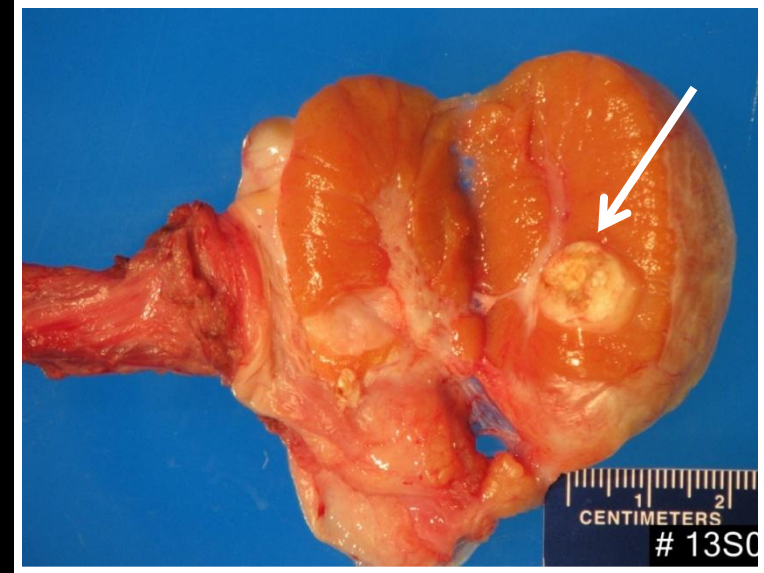
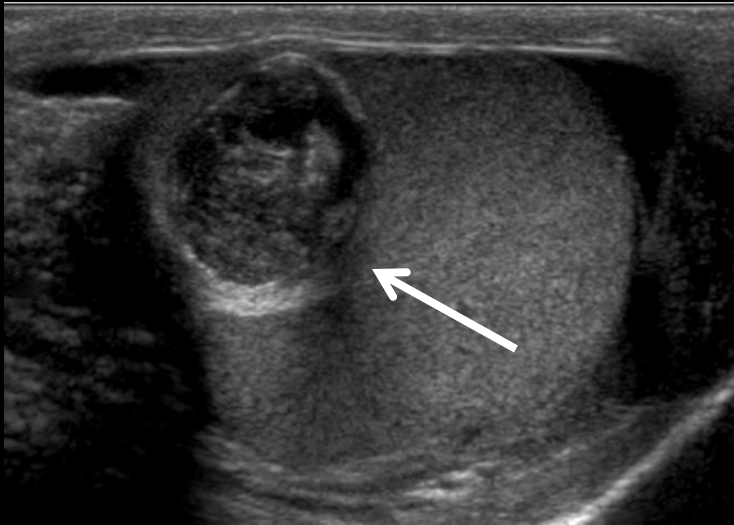
- 1% of all testicular tumors
- 0.5-10.5 cm in diameter
- Most common in 2nd-4th decade
- No malignant transformation

## Imaging, pathology and treatment

- Well-circumscribed encapsulated round mass
- Alternating hypo and hyperechoic rings (onion skin appearance) or echogenic center (bull's eye or target appearance)
- No blood flow
- Keratinizing squamous epithelium within a fibrous wall
- Treatment: local excision



# Epidermoid Cyst



Imaging: Well-circumscribed predominantly hypoechoic lesion with an echogenic rim and lamellated periphery with heterogeneous internal echotexture in the medial aspect of the left testicle abutting the mediastinum

Pathology: epidermoid cyst

# Paratesticular Masses

- 3-5<sup>th</sup> decade
- Usually slow-growing
- Most are benign
  - Adenomatoid, most common (30%)
  - Papillary cystadenomas
  - Leiomyomas
- Malignant masses, extremely rare in adults
  - Adenocarcinomas
  - Sarcomas
    - Rhabdomyosarcomas
    - Leiomyosarcoma
    - Liposarcoma



# Adenomatoid Tumor

## Demographics

- Benign solid tumor of epididymis
- Most common solid mass of epididymal tail
- > 3<sup>rd</sup> decade
- 98% asymptomatic
- Can slowly enlarge over time

## Imaging and treatment

- Solid round or oval mass
- Most often in epididymal tail (4x more common)
- Mostly iso- or hypoechoic
- Rarely cystic
- Typically hypovascular
- Treatment: benign, although most are surgically excised to confirm diagnosis

# Scrotal Liposarcoma

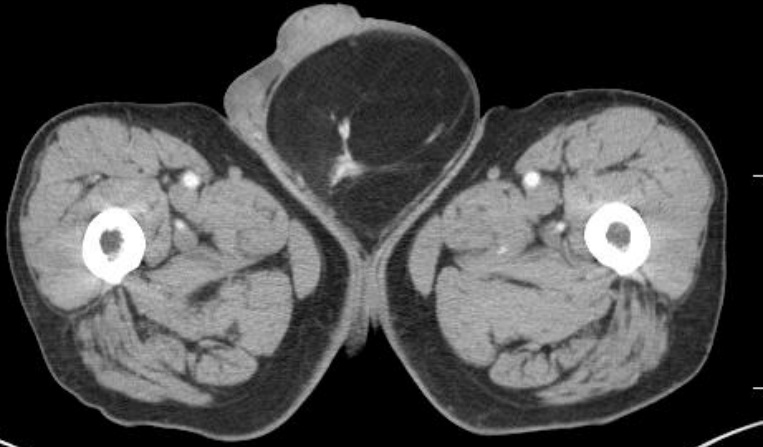
## Demographics

- Solid, bulky lipomatous malignant tumor
- 2<sup>nd</sup> most common soft tissue tumor in adults, 10-16% incidence
- Lipoma of spermatic cord
  - ~7% paratesticular sarcomas
- Middle aged and elderly
- Up to 1/4 recur, 1/10 metastasize
- Round cell type: poorly differentiated and highly metastatic

## Imaging and treatment

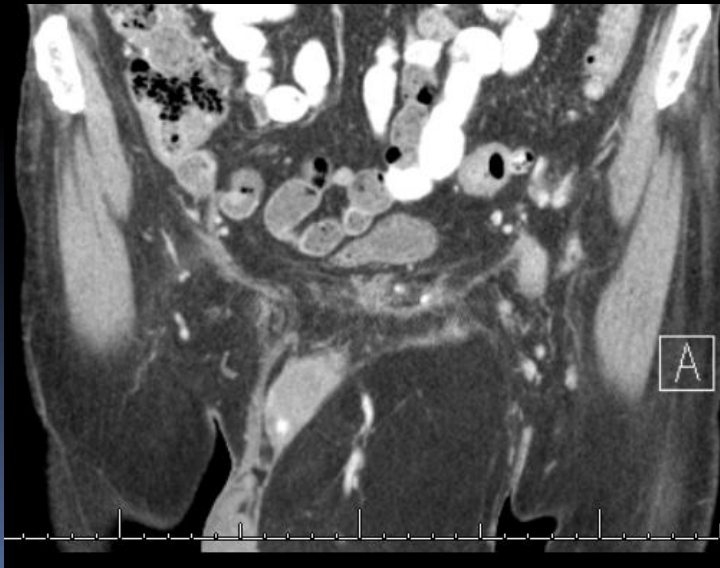
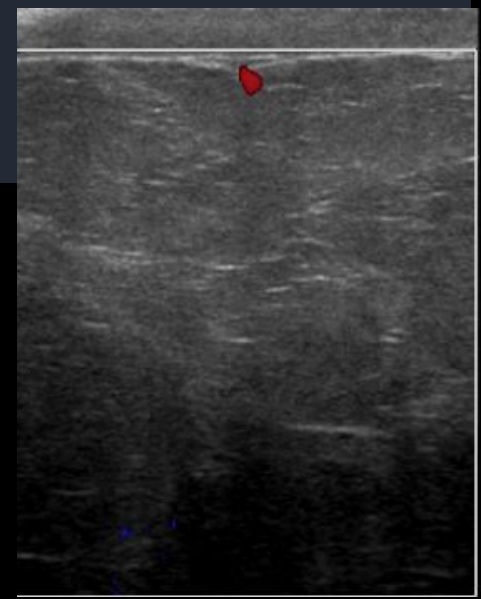
- Nonspecific imaging appearance on US. If can identify fat, helpful
- Often contain calcification
- CT and MR more specific for recognition of fatty tissue
- Treatment: excision including inguinal lymph nodes
  - Additional treatment depends on stage and histologic profile

# Scrotal Liposarcoma

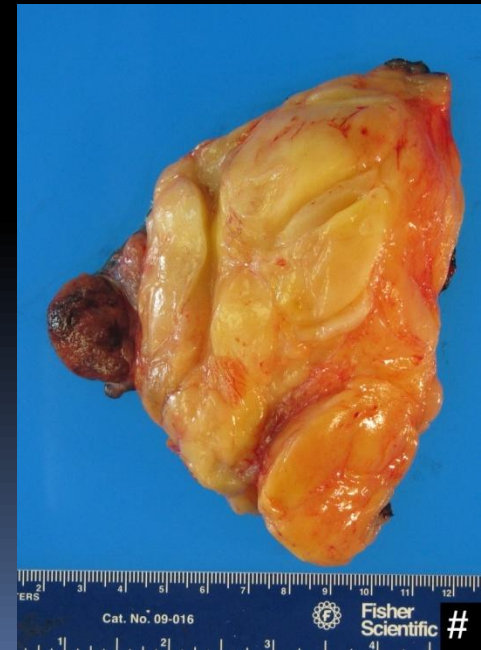


CT: Fat density mass in the left inguinal canal extending into the left hemiscrotum

Ultrasound:  
Nonspecific minimally vascular heterogeneous echogenic tissue in the inguinal canal and left hemiscrotum



Pathology: well-differentiated liposarcoma abutting but not involving the testes and epididymis



# Mimics/Pitfalls

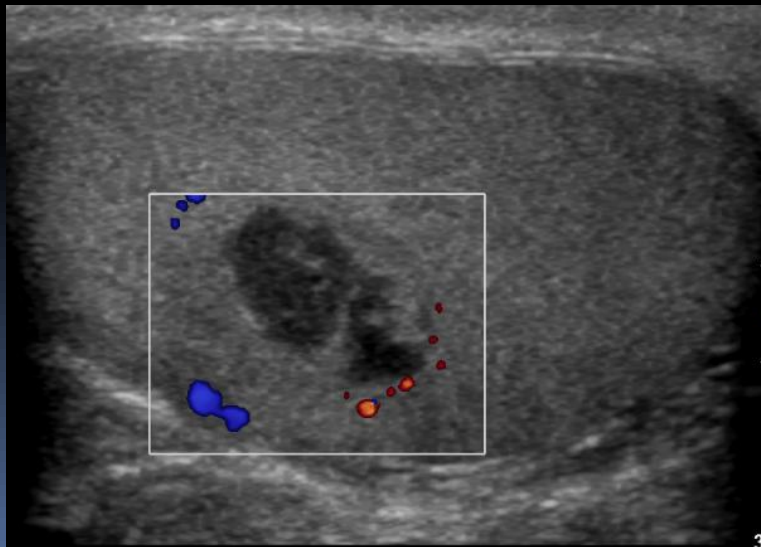
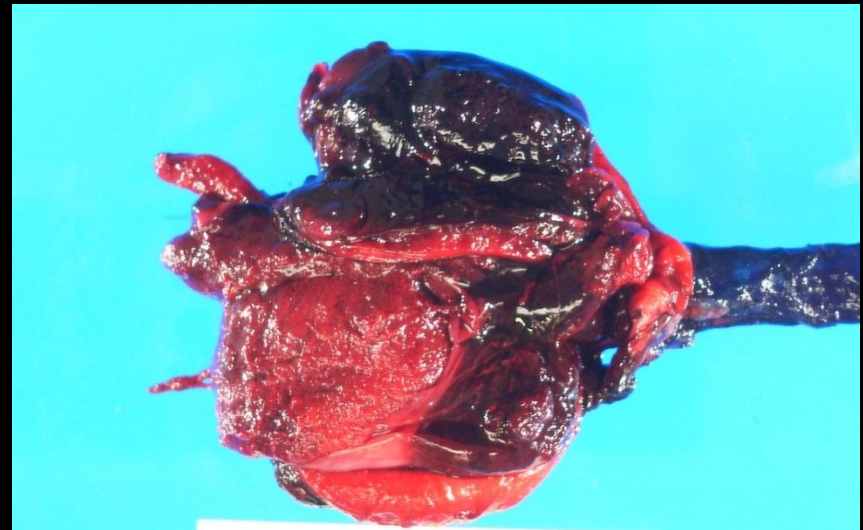
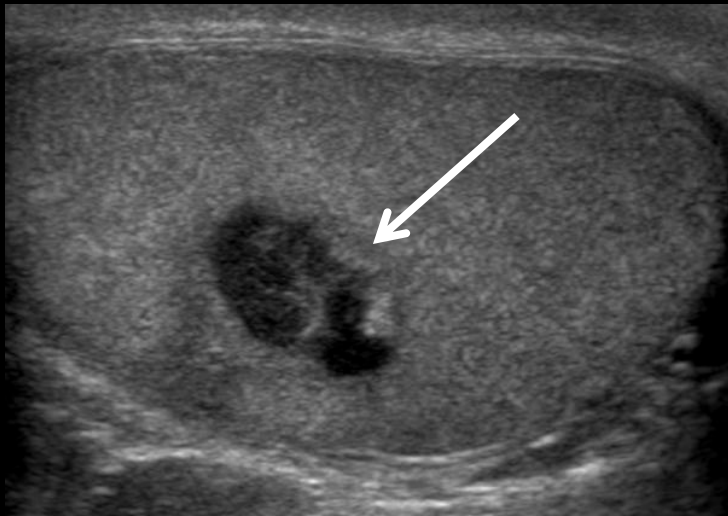
## Testicular

- Infarct
- Rete testis cyst
- Hematoma
- Abscess

## Paratesticular

- Paratesticular cystic lesions can rarely mimic solid tumors
  - Spermatocele
  - Complicated epididymal cyst
  - Tubular ectasia of rete testis
  - Tunica albuginea cyst
  - Hematocele
  - Pyocele
  - Complicated hydrocele

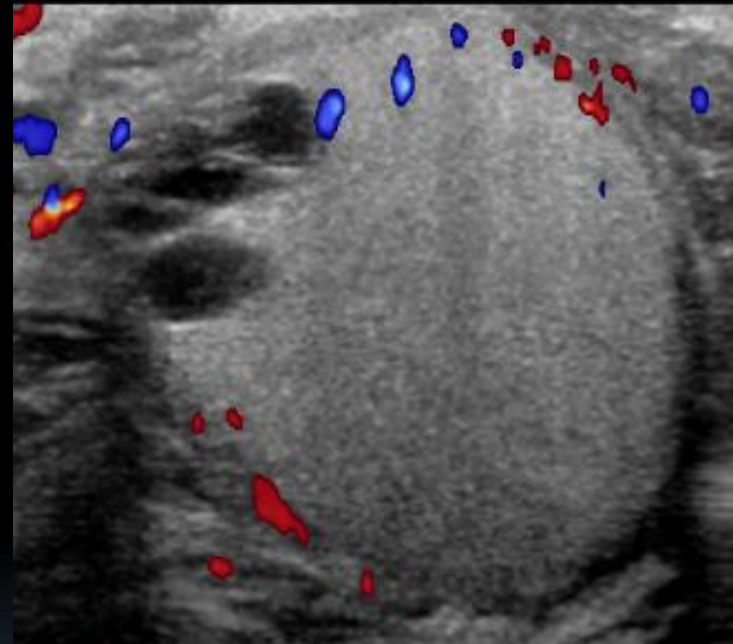
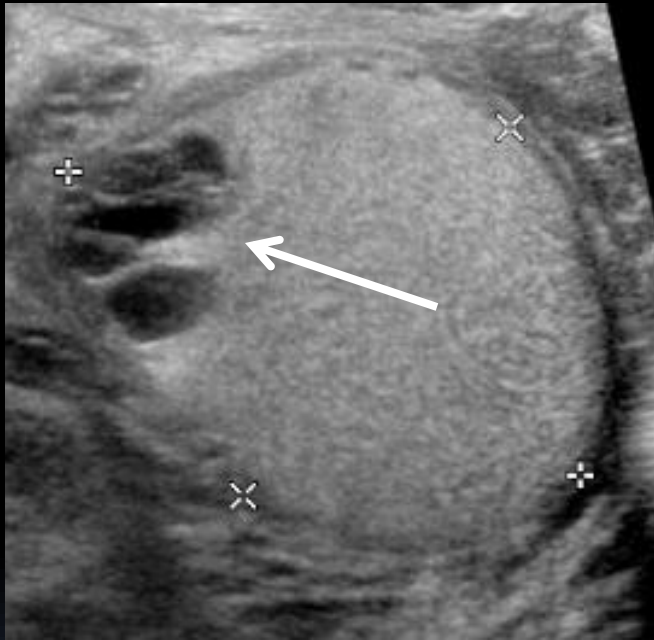
# Testicular Tumor Mimic: Subacute Testicular Infarct



Heterogeneously hypoechoic solid and cystic lesion of the testis without definite blood flow to the solid component

Pathology: Small circumscribed infarct without evidence of malignancy

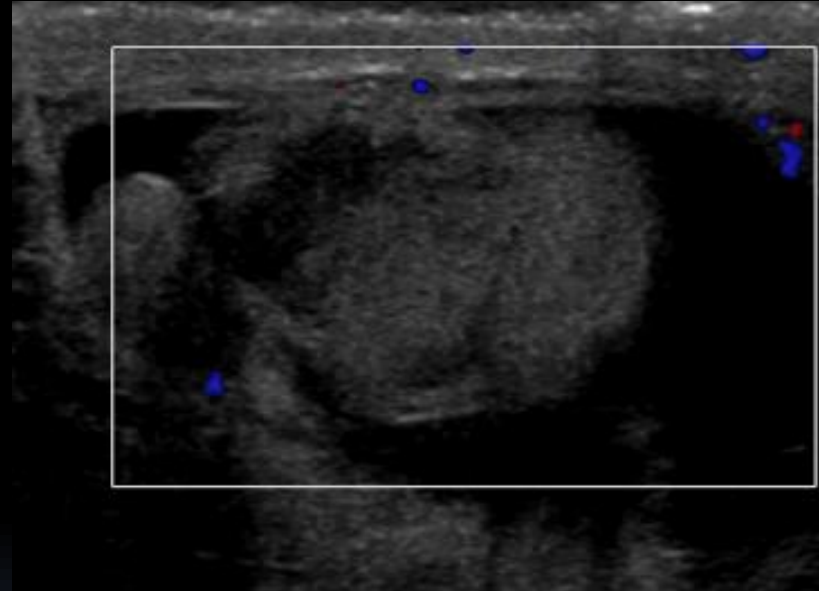
# Testicular Tumor Mimic: Cystic Dilatation of Rete Testis



Imaging: Several small cystic lesions in the periphery of the testis, consistent with cystic dilatation of the rete testis

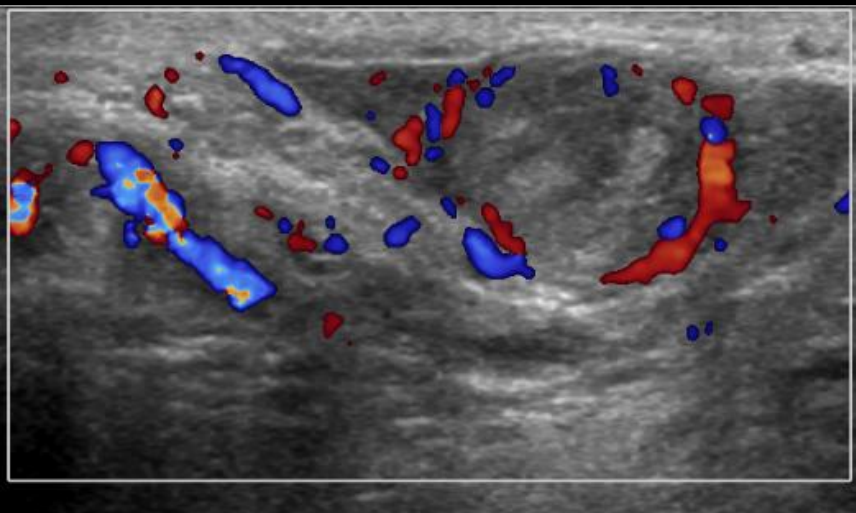
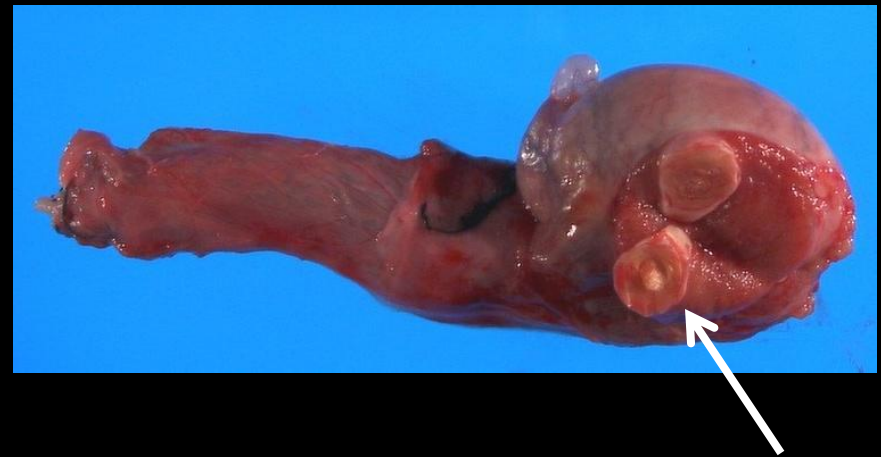
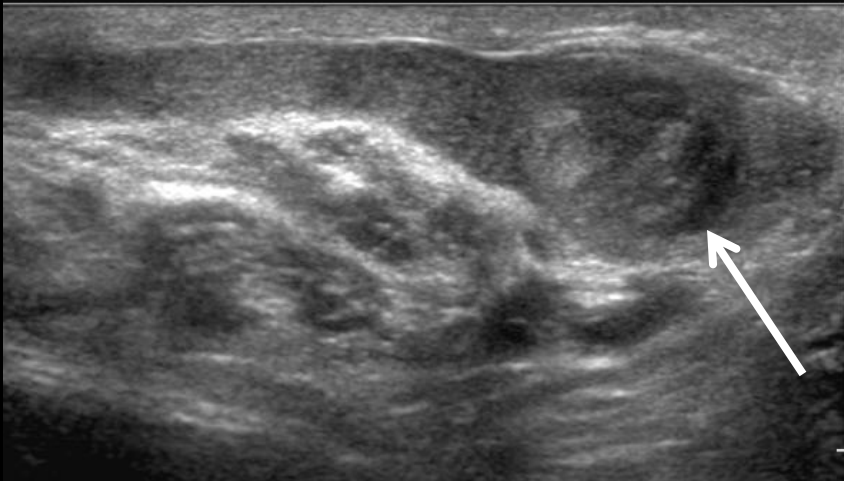


# Testicular Tumor Mimic: Testicular Hematoma



Imaging: Avascular , heterogeneous parenchymal echogenicity of testis in a patient with history of trauma

# Paratesticular Tumor Mimic: Complicated Epididymal Tail Cyst



Imaging: Complex heterogeneous solid and cystic lesion of the epididymal tail with peripheral vascularity

Pathology: benign epididymal cyst with hemorrhage



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