Inguinoscrotal Conditions

In Infants and Children

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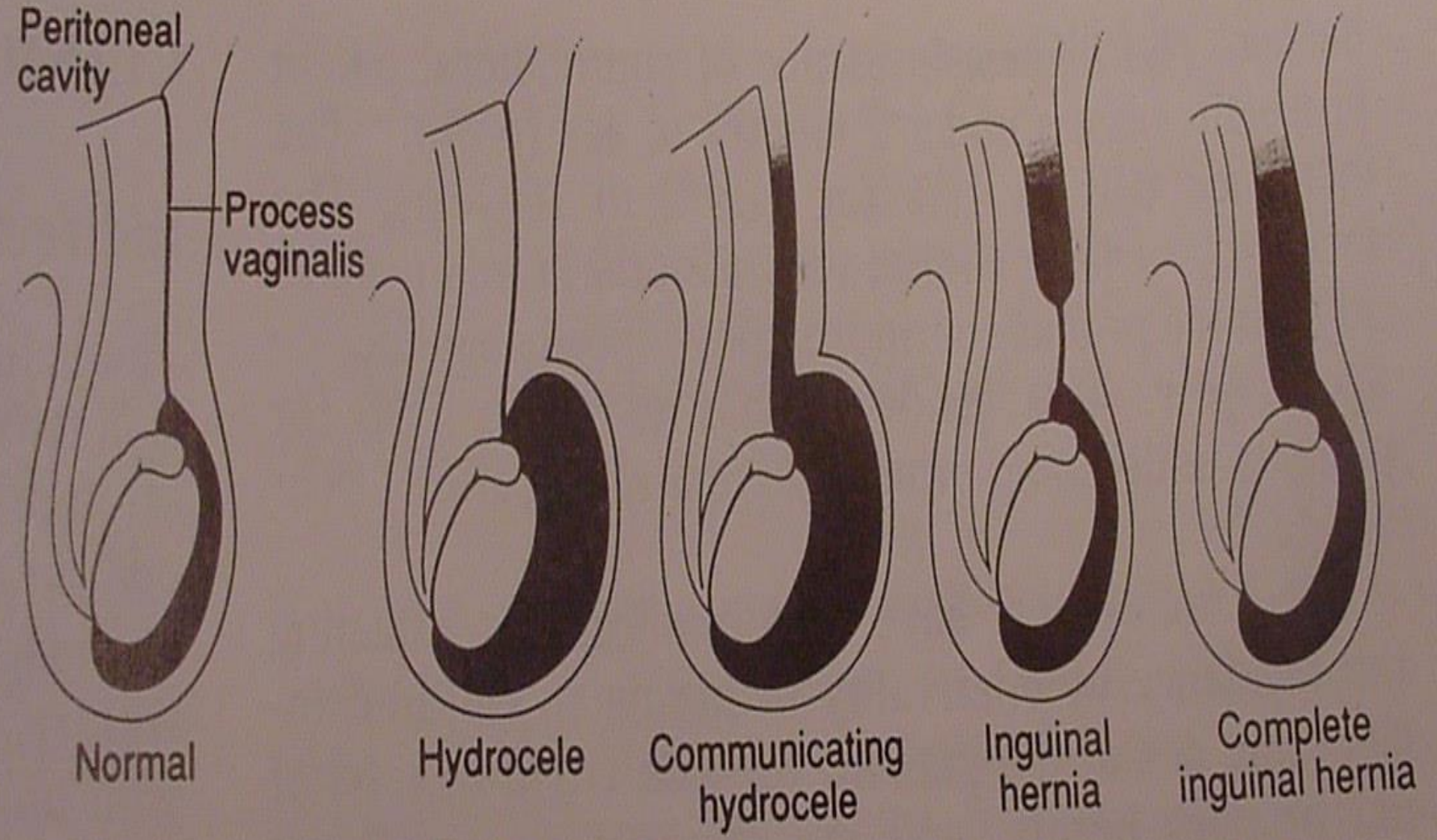
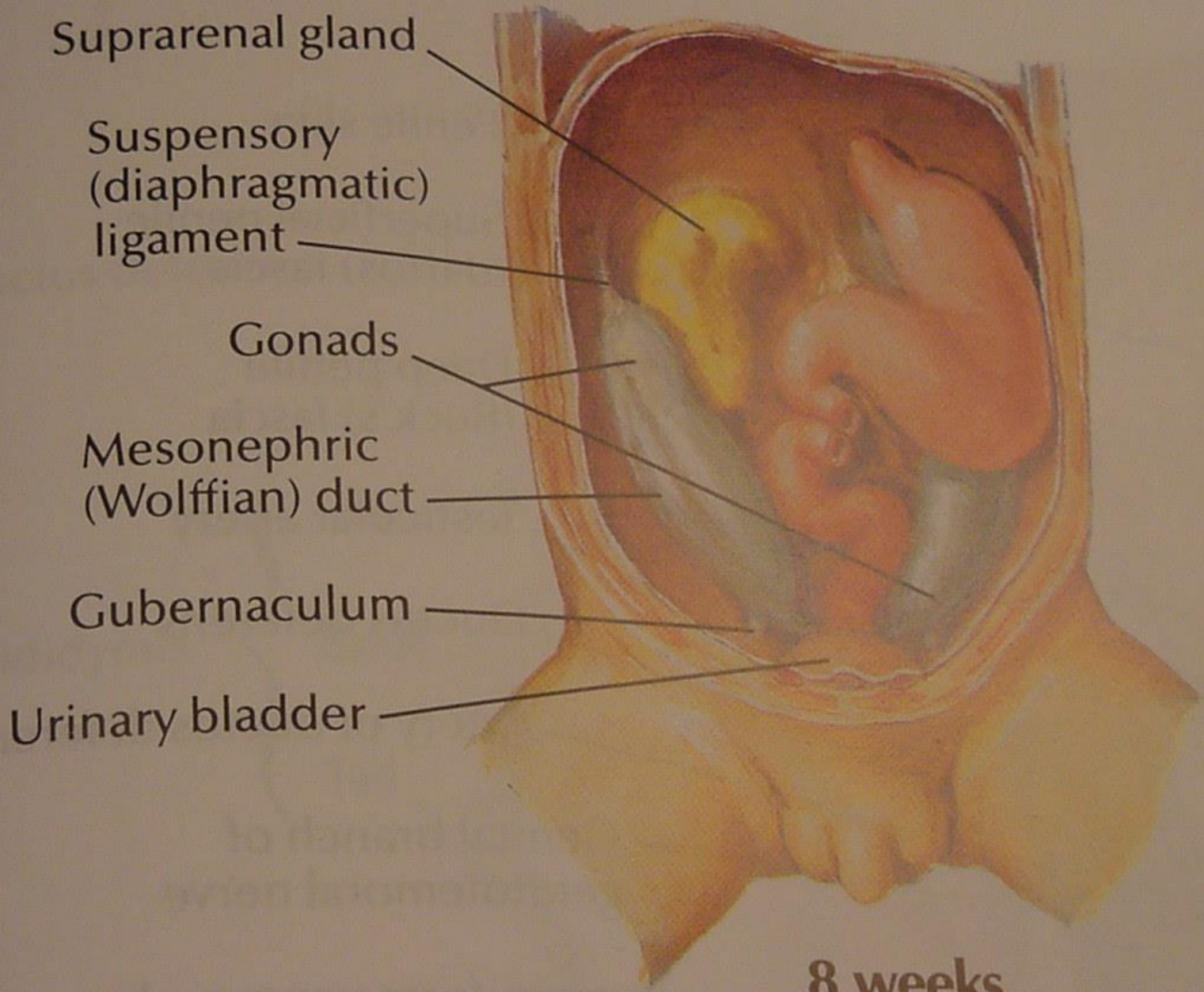
Inguinoscrotal Pathology

- Inguinal Hernia
- Hydrocele
- Undescended Testis
- Acute Scrotum
- Tumors
- Idiopathic edema

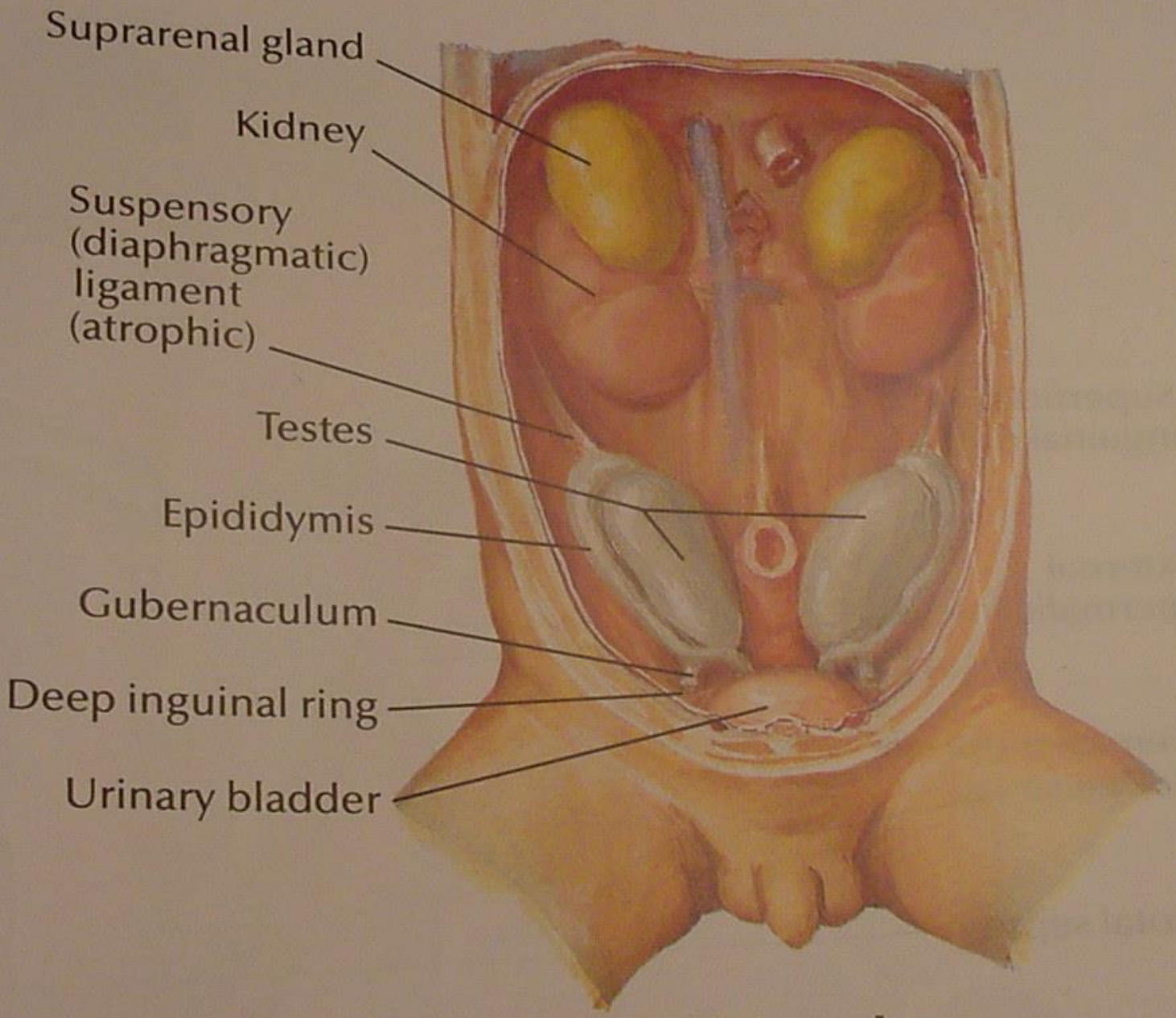
Groin Hernias – Embryology & Anatomy

- **The processus vaginalis is present in the developing fetus at 12 weeks in utero**
- **The processus is a peritoneal diverticulum that extends through the external inguinal ring**
- **As the testis descend at the 7th to 8th months, a portion of the processus attaches to the testis, as it exits the abdomen and is dragged into the scrotum with the testis**

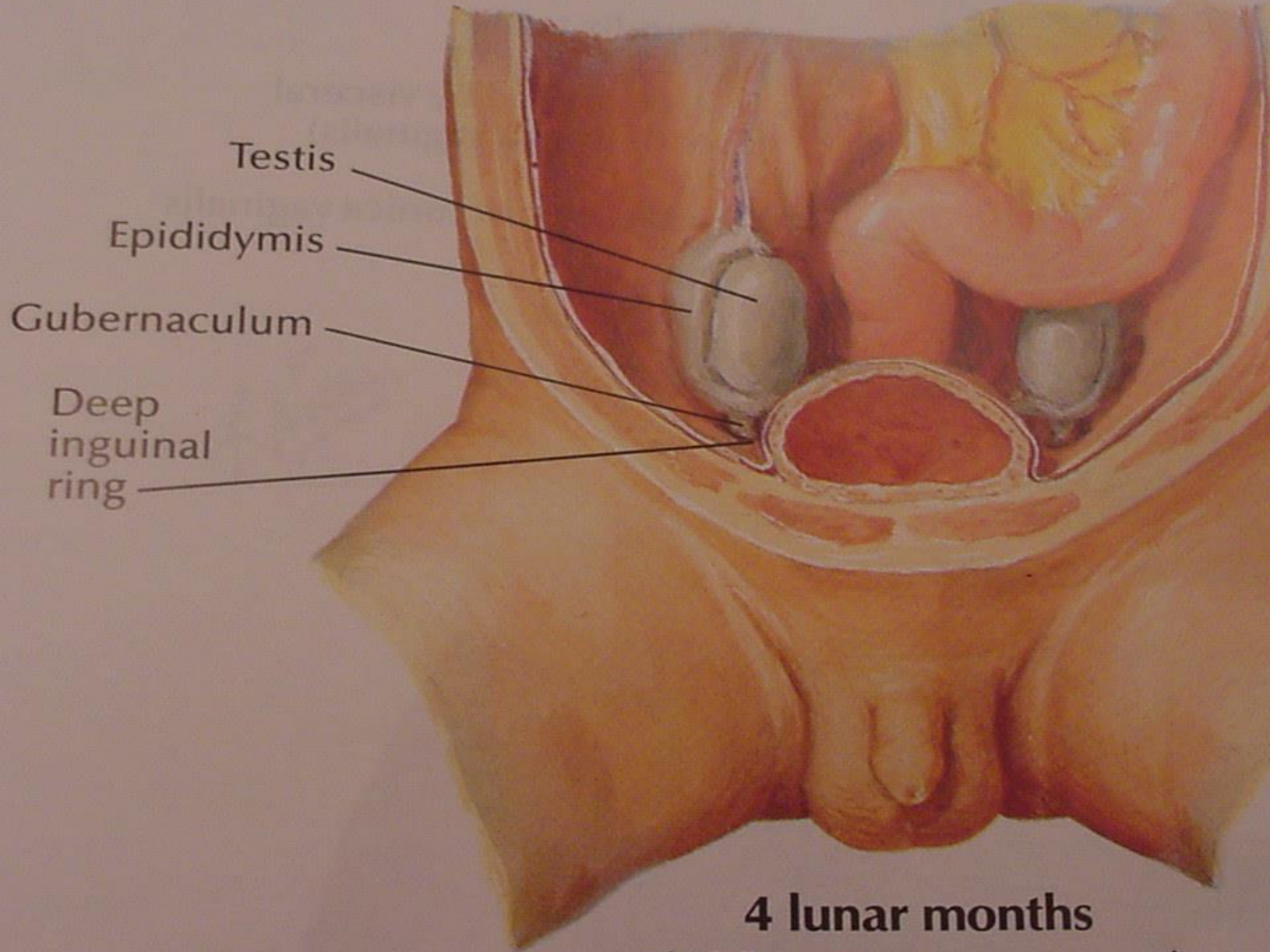

Peritoneal cavity
Process vaginalis
Normal
Hydrocele
Communicating hydrocele
Inguinal hernia
Complete inguinal hernia

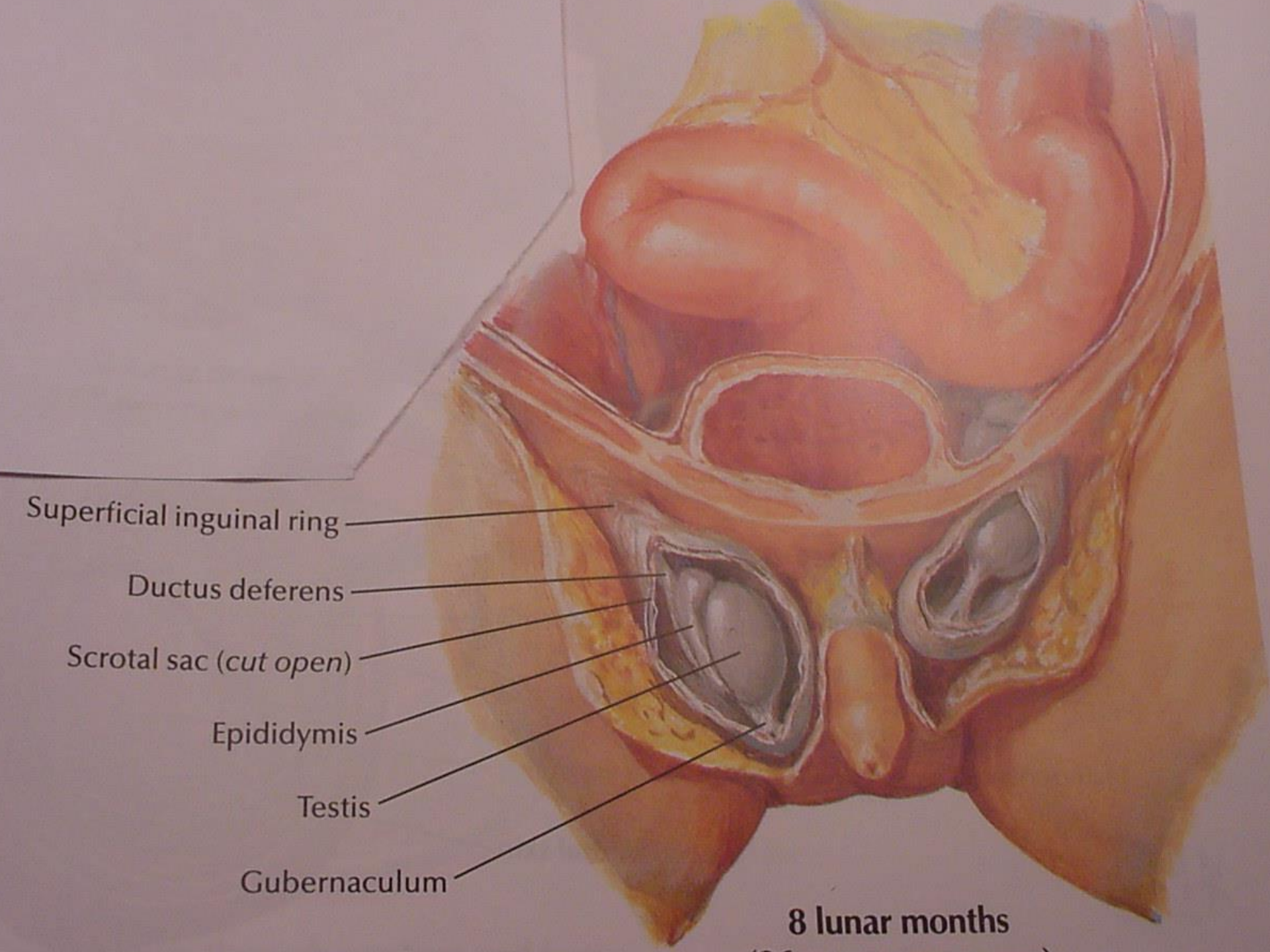

Suprarenal gland
Suspensory (diaphragmatic) ligament
Gonads
Mesonephric (Wolffian) duct
Gubernaculum
Urinary bladder

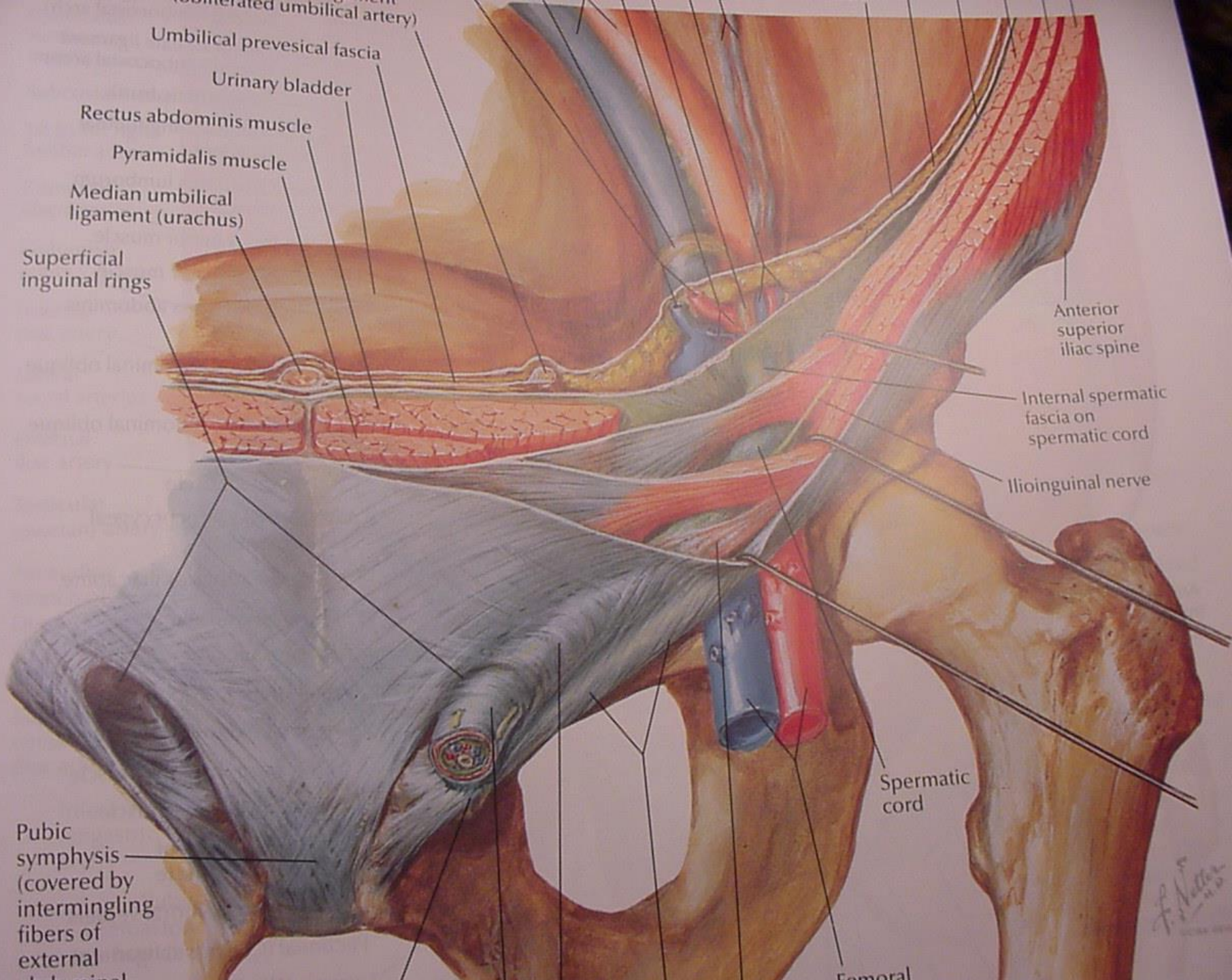
8 weeks


Suprarenal gland
Kidney
Suspensory (diaphragmatic) ligament (atrophic)
Testes
Epididymis
Gubernaculum
Deep inguinal ring
Urinary bladder

11 weeks


Testis
Epididymis
Gubernaculum
Deep inguinal ring
4 lunar months


Superficial inguinal ring
Ductus deferens
Scrotal sac (*cut open*)
Epididymis
Testis
Gubernaculum
8 lunar months


obliterated umbilical artery)
Umbilical prevesical fascia
Urinary bladder
Rectus abdominis muscle
Pyramidalis muscle
Median umbilical ligament (urachus)
Superficial inguinal rings
Anterior superior iliac spine
Internal spermatic fascia on spermatic cord
Ilioinguinal nerve
Spermatic cord
Pubic symphysis (covered by intermingling fibers of external

Inguinal Hernia

Inguinal hernia? Or Hydrocele?

- Congenital (PPV)
- Prevalence (1-5% boys)
- Premature (35%)
- Male/Female (9:1)
- Indirect (99%)
- R > L

- Peak incidence in 1st year of life-common in premies
- Rt side- 60%
- Lt side-25%
- Bilateral-15%

Associated Conditions – Inguinal Hernia

- Cystic Fibrosis
- Connective tissue disorders
  - Ehlers-Danlos syndrome
  - Hunter-Hurler syndrome
- Developmental dysplasia of the hip (DDH)
- Chronic peritoneal dialysis
- Preterm infants with intraventricular hemorrhage
- Myelomeningocele with VP-shunt
- Undescended testis

Inguinal Hernia

History

- Intermittent groin swelling
- Asymptomatic until get complicated
- In girls, lump in upper part of labia majora

Examination

- Examine the testes
- Reducibility
- Thickened spermatic cord

Complicated Inguinal Hernia

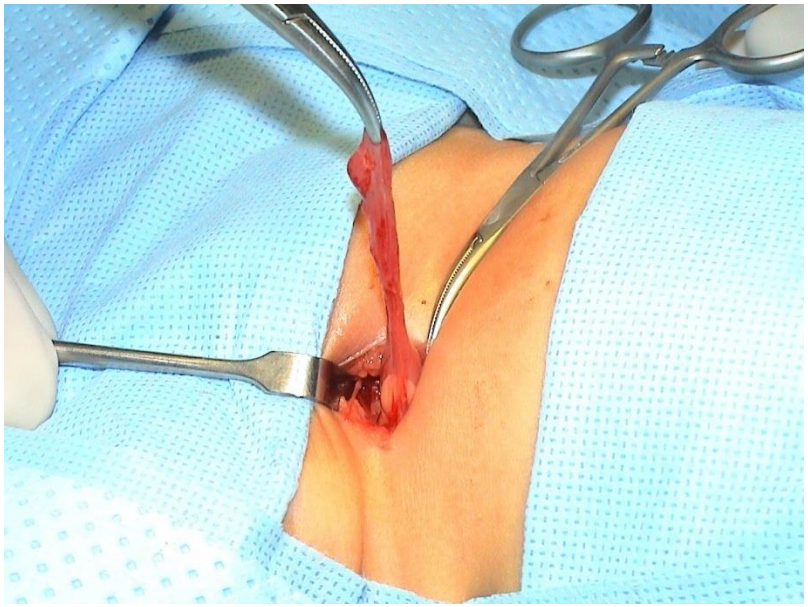
- Incarcerated hernia:
  - Irreducible swelling
  - No evidence of bowel obstruction or strangulation
- Obstructed hernia:
  - Irreducible swelling
  - Symptoms and signs of bowel obstruction (bilious vomiting, abdominal distention, constipation)
- Strangulated hernia:
  - Irreducible swelling
  - Symptoms and signs of strangulation (severe groin pain, fever, tachycardia, skin discoloration of the groin)

- Incarceration – Premature Neonates<1yr 50%
- In huge hernia – Testicular atrophy in boys
- -- Ovarian atrophy in girls
- -- Mature Neonates < 1yr 30%
- -- Mature Neonates > 1yr 15%
- Strangulation -- Gangrenous bowel +

Inguinal Hernia

Management:

- Herniotomy (as soon as it is feasible)
- Incarcerated hernia
  - +/-Sedation and analgesia
  - Manual Reduction
  - Urgent herniotomy
- Strangulated hernia
  Emergent herniotomy +/- bowel resection



Operation

- Inguinal skin crease incision
- Incise External oblique aponeurosis and extend into superficial ring
- Dissect off hernial sac from cord
- structures
- High ligation of sac Herniotomy
- Close wound in layers

Complications

- Injury to Vas deferens & vessels
- Testicular atrophy due to testicular artery injury
- Recurrence due to failure of high ligation
- Wound infection in obstructed & strangulated hernia
- Hydrocele when distal hernial sac around testis hasn't been left open

Inguinal Hernia and Hydrocele

- Peritoneal fluid collection in processus vaginalis
- Diurnal variation in size
- Positive fluctuation & Transillumination

- Regression & spontaneous closure of processus vaginalis by 1 to 1.5 yrs
- Get above the swelling+ve
- Huge Hydrocele Pressure atrophy of Testis

Hydrocele

History:

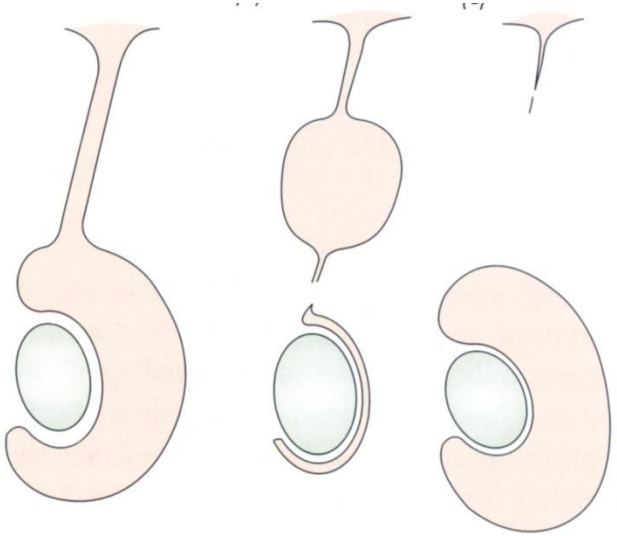
- Scrotal swelling
- Asymptomatic
- 1% over one year of age

Examination:

- Get above the swelling
- Not reducible (most accurate)
- Transilluminates

Management:

- Surgery not advised < 2 years of age
- Ligation of PPV



Undescended Testis

Descent of Testis – 2 Phases

- 10-15th week: the gubernaculum enlarges to anchor the testis near the inguinal region as the embryo enlarges
- 28-35th week: the gubernaculum migrates out of the inguinal canal across the pubic region and into the scrotum
- The processus vaginalis develops as a peritoneal diverticulum within the elongating gubernaculum, creating an intraperitoneal space into which the testis can descend

Epidemiology

- The most common congenital anomaly of the male genitalia.
- A study looking at the birth prevalence of cryptorchidism in northern England from 1993-2000 found that it was 7.6 per 1,000 live births.
- The incidence has not changed much over a period of fifty years.
- There is a higher incidence in premature babies (up to 30%).
- It affects almost 1% of all full-term male infants at the age of 1 year.
- Unilateral cryptorchidism is four times more likely than bilateral

Retractile testes

- Prepubertal boys can have an exaggerated cremasteric reflex.
- The testis may retract out of the scrotum in the cold, on examination, on excitement or on physical activity.
- It is normal and will descend when relaxed and warm, or it can be manipulated back into the scrotum.
- Retractile testes do not need any treatment but do need close follow-up until puberty, as they can become ascendant.
- Retractile testes have a 32% risk of becoming an ascending or acquired undescended testis.

The ascending testes

- A previously normal or a retractile testis can become high with a shortened spermatic cord that prevents the testis from staying in the scrotum.
- It is a rare condition which occurs more commonly on the left side.
- It is usually diagnosed in those aged 8-10 years.
- Some sources say that this needs corrective treatment but others suggest a 'wait-and-see' approach for spontaneous descent until puberty.
- One study found that acquired undescended testis had a 77.5% tendency to spontaneous descent in puberty. Long-term testicular growth matched that which followed pubertal orchidopexy (ie it was in the normal range).

Maldescended testes

- These are usually unilateral.
- The scrotum may be underdeveloped.

- Maldescent may be due to an anatomical abnormality or due to hormone lack or hormone resistance. The release of testosterone from the fetal testis, the release of substances from an intact genitofemoral nerve and gonadotrophin hormone have all been cited as having possible involvement in normal testicular descent.

- Descent can be:
  - Arrested - where descent is along the normal path but incomplete. The testis may be located near the pubic tubercle, in the inguinal canal (80%), or, uncommonly, in the abdomen. The testis is often small and abnormal with a short spermatic cord. There may be associated inguinal hernia.
- Ectopic - where descent deviates from the normal path. The testis is most often found in the superficial inguinal pouch. Perineal, abdominal (5% of undescended testes in one study), pelvic, crural, penile and femoral positions are also all possible. The testis and spermatic cord are usually normal.

Undescended Testis

Definitions:

- True undescended testis
- Ectopic
- Retractile
- Ascending

Incidence:

- At birth: 3-4%
- At one year: 1%
- Pre-term: 30%

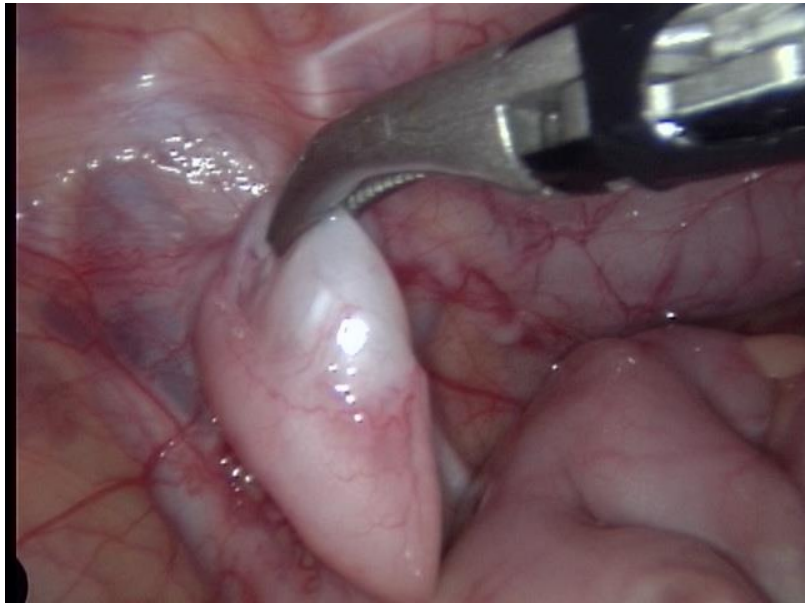
Palpable 80%

Non palpable 20%

Undescended Testis

Diagnosis:

- Parents/Doctors
- Clinical features
  - Empty scrotum
  - Palpable or not
  - Milk it down to scrotum
- Imaging? (limited role)
- Laparoscopy
  - Diagnostic
  - Therapeutic



Management

- If, by the age of 1 year, descent has not occurred, spontaneous descent is unlikely.
- Treatment should be initiated, as there is also potential for histological deterioration and loss of testicular quality (may affect future fertility).
- Treatment should be completed by 12-18 months of age.

Medical treatment

- Testicular descent is hormonally dependent.
- Treatment with human chorionic gonadotrophin (hCG) or gonadotrophin-releasing hormone (GnRH) can be used.
- Success rates are best the lower the undescended testis is located.
- Maximum success rates are 20%.
- Side-effects of hCG treatment can include enlargement of the penis, pubic hair growth, increased testicular size and aggressive behaviour during treatment.

Surgical treatment

- **If the testis is palpable**: an inguinal approach is usually used. Orchidopexy or can be performed. Success rates are up to 92%. Some authorities recommend orchidopexy as early as 6 months in order to preserve spermatogenesis.
- One study reports the successful use of trans-scrotal orchidopexy.

- **If the testis is non-palpable**: examination under anaesthetic may reveal the previously non-palpable testis.
- If not, inguinal surgical exploration ± laparoscopy is needed. Every attempt should be made to locate the non-palpable testis. It is likely that the testis will be found just through the inguinal incision but laparoscopy may be needed to search the abdomen. Removal or orchidopexy can then be performed laparoscopically.

Associations

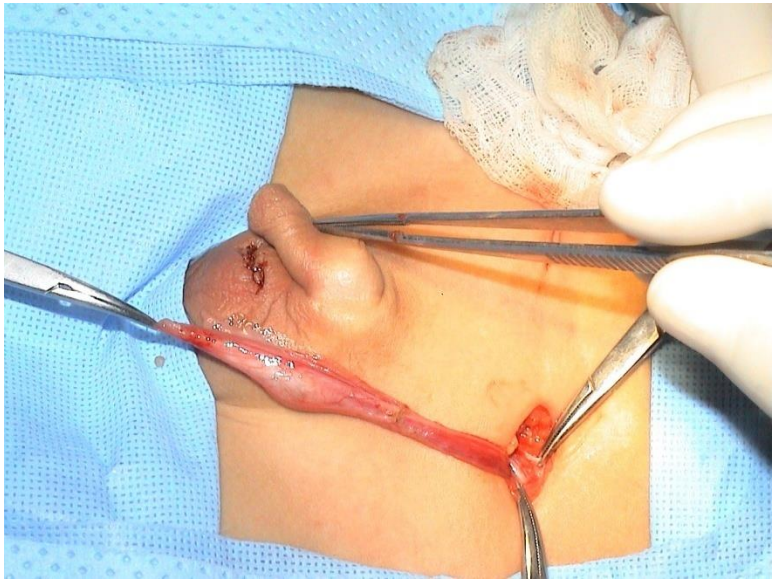
- **Complications**
- Increased risk of testicular torsion. This may be associated with the development of a testicular tumour. Torsion of an intra-abdominal testis may present as an acute abdomen.
- Increased risk of testicular trauma.

- **Effect on fertility**
- Boys with one undescended testis have a lower fertility rate but the same paternity rate as boys with bilateral descended testes.
- Boys with bilateral undescended testes have lower fertility and paternity rates.

- **Risk of testicular malignancy**
- There is a history of cryptorchidism in 5-10% of testicular cancers.
- Prepubertal orchidopexy for cryptorchidism may be associated with a lower risk of testicular cancer.
- Orchidopexy facilitates testicular self-examination.

- **Cosmetic appearance**
- Surgical transfer of the testis into the scrotum produces a better cosmetic appearance.
- Prostheses may be used if the testis is removed. Prostheses should be implanted during adolescence.

Undescended Testis

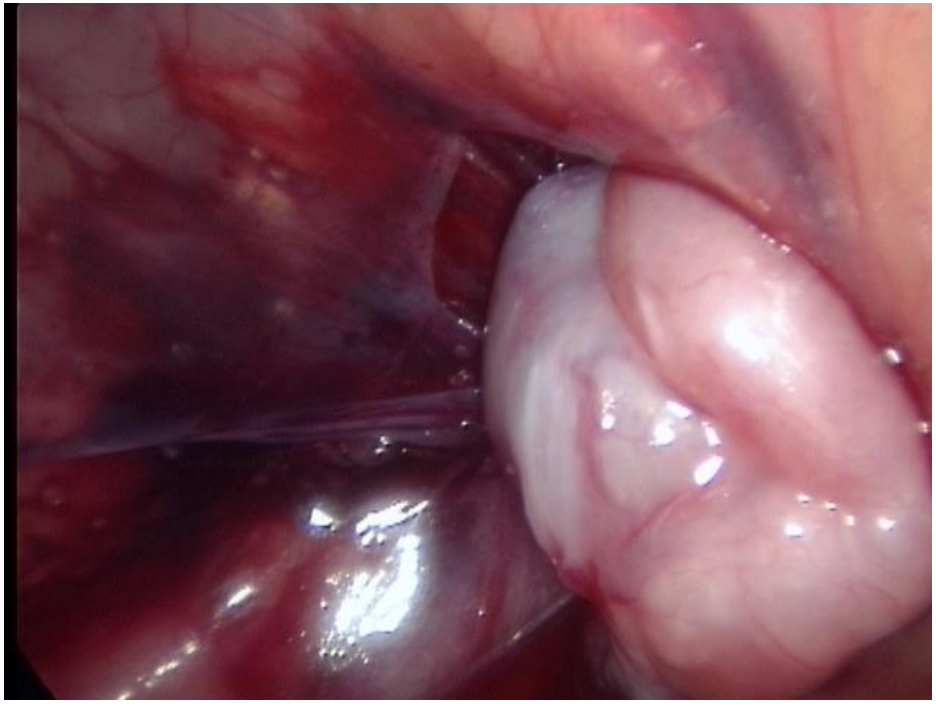


Indications:

- Abnormal fertility
- Testicular tumor
- Cosmetic/Social
- Trauma/Torsion

Treatment (6 months):

- Palpable - open orchiopexy
- Nonpalpable -
  - Laparoscopy assisted orchiopexy
  - Two stages Fowler-Stephens orchiopexy



Acute Scrotum

Introduction:

- Acutely painful +/- swollen +/- red scrotum

Pediatric surgical emergency!!!

Causes:

- Testicular Torsion
- Torsion of Appendage(s) (commonest for prepubertal boys)
- Epididymo-orchitis (commonest for postpubertal boys)
- Idiopathic Scrotal Edema
- Other conditions e.g. Incarcerated hernia, Acute hydrocele, HSP, Trauma

Testicular Torsion

Introduction:

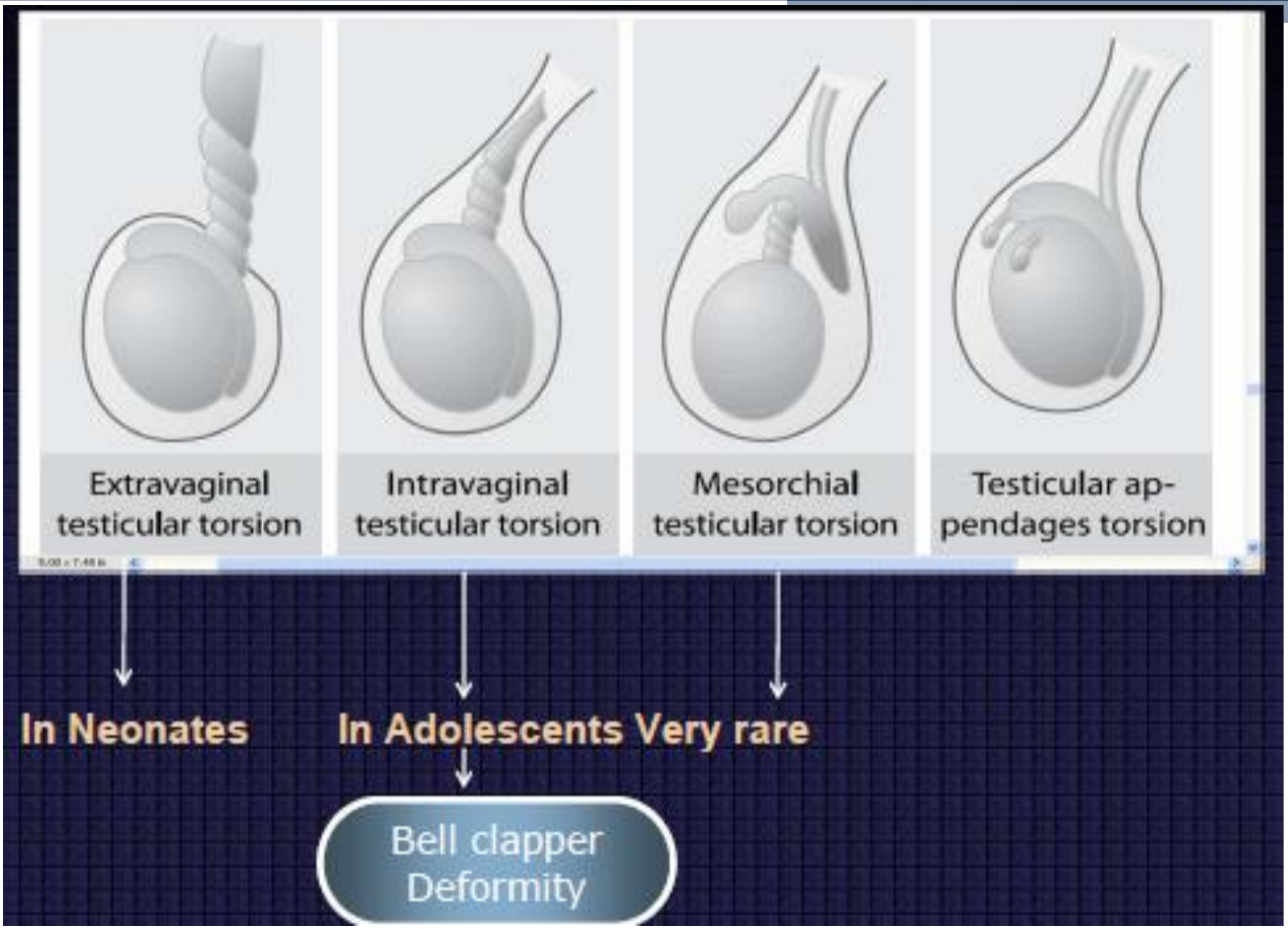
- Incidence: 1:4000
- Two peaks: peripubertal and perinatal
- Affects Left side more

Symptoms:

- Lower abdominal pain and vomiting
- Hemiscrotal pain
- Swollen → red hemiscrotum

Signs:

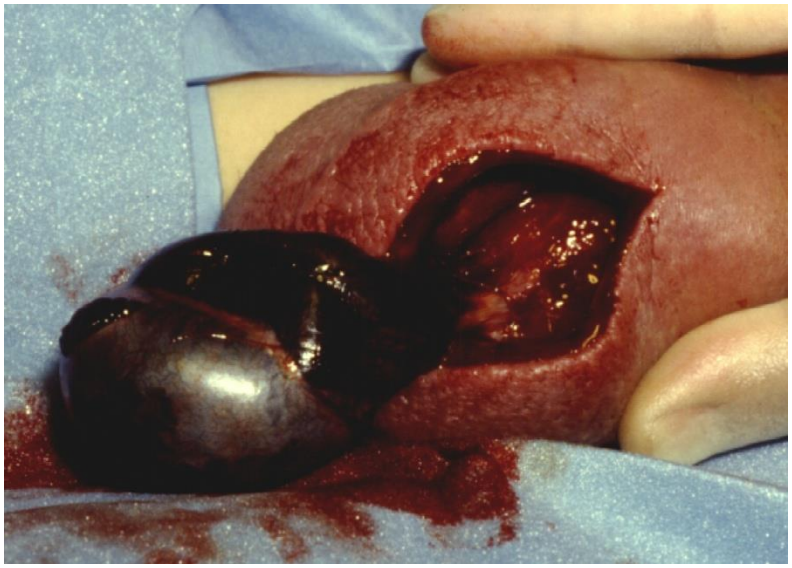
- Tender
- Cremasteric reflex- absent (most specific)
- Lies higher than contralateral testis
- Horizontal in position


Extravaginal testicular torsion
Intravaginal testicular torsion
Mesorchial testicular torsion
Testicular ap-pendages torsion
In Neonates
In Adolescents
Very rare
Bell clapper Deformity

Duration of Torsion and Testicular Salvage

Duration of Torsion (Hours)	Testicular Salvage (%)
< 6	85-97
6-12	55-85
12-24	20-80
>24	<10

Testicular Torsion



Investigations:

- Color Doppler US
- Radionuclide Scan

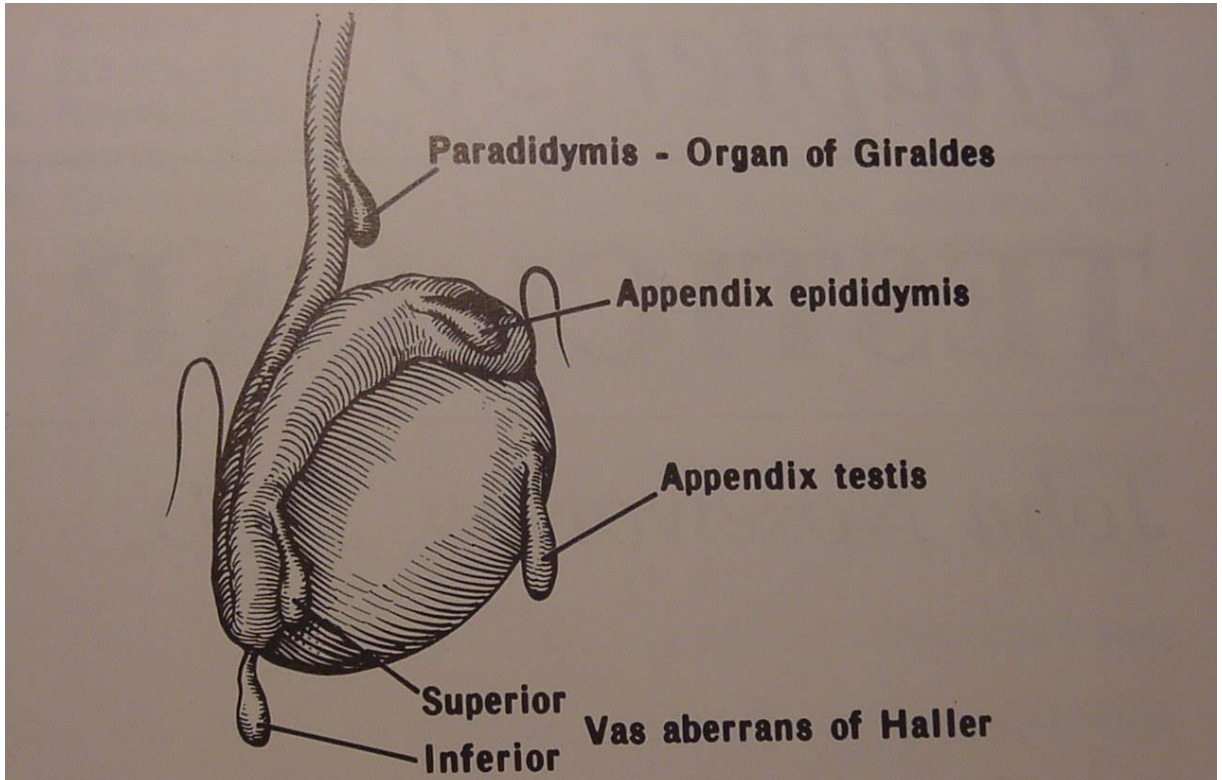
Management:

- Timing is critical 4 - 6 hours
- Exploration if any doubt
- Untwist (open book) and assess viability
- Fix the other side
- If more than 12 hours, it is likely to be non-viable and may need orchiectomy

Central testicular blood flow→ Normal Testis

No Central testicular blood flow but excessive peripheral blood flow

Testicular Appendages



IGURE 50–1. Testicular appendages. (From Rolnick D, Kawanoue , Szanto P, et al.: Anatomical incidence of testicular appendages.

Torsion of Appendage(s)

Introduction:

- Embryological remnants of the mesonephric and mullerian duct system occur as tiny (2-10mm long) appendages of testis
- Appendix testis (hydatid of Morgagni), appendix epididymis …etc
- Peak age: 10-12 yrs

Presentation:

- pain – more gradual onset
- Blue dot sign
- Swollen → red hemiscrotum

Color Doppler scan

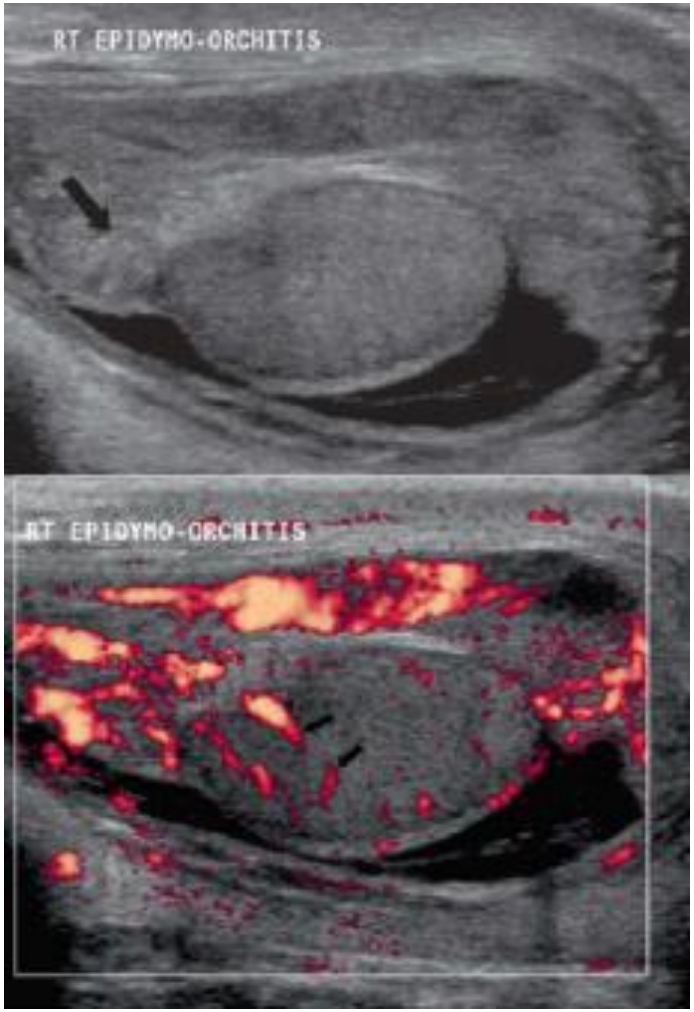
Management: Conservative or operative if torsion cannot be excluded

Epidimo-orchitis

- Inflammation of epididymis & Testis due to infection or trauma
- Sudden onset of pain in a hemiscrotum
- Commonly associated with UTI
- Thickened & Tender epididymis
- Pain relief by elevation of hemiscrotum ⟶ Prehn's sign
- Can be treated conservatively with antibiotics and antiinflammatory drugs

- **USG Scrotum**
- Thickened Epididymis
- Reactive Hydrocele
- Thick Scrotal wall

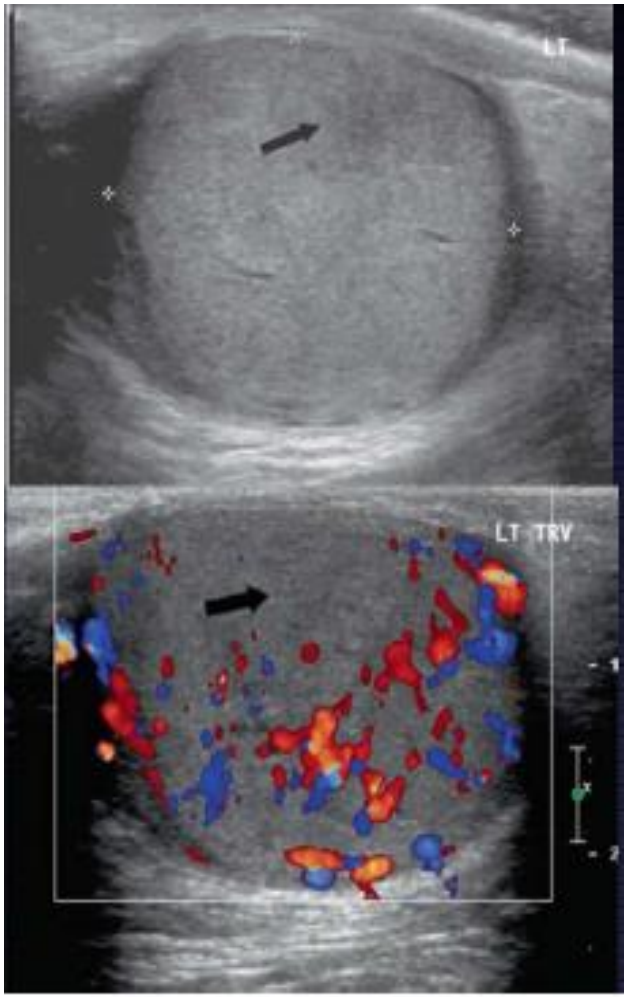
- **Doppler Scan**
- Excessive blood flow to Epididymis
- Normal Testicular parenchymal blood flow



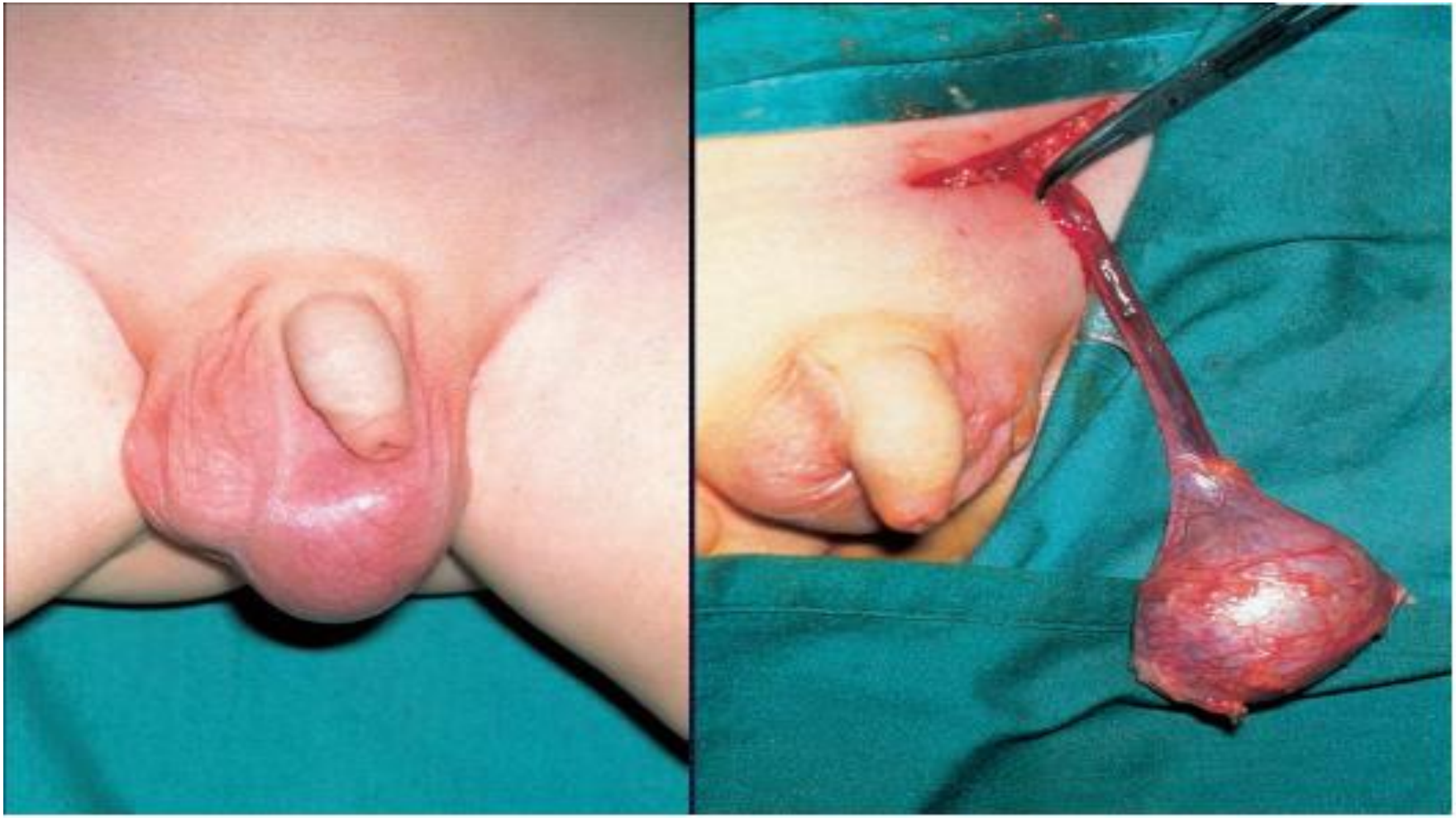
Testicular Tumor

- Account for 1% of all pediatric malignant tumors
- Most are germinal in origin & Malignant
- Present before the age of 3 yrs
- Endodermal sinus tumor Commonest malignant tumor
- Teratoma ⟶ Commonest benign tumor
- Rhabdomyosarcoma ⟶ Arise from paratesticular tissues

- **USG Testis**
  - Anterior Hypoechoic area Testicular Tumor
- **Doppler Scan**
  - Hypovascular intratesticular tumor



- Present with painless hard testicular swelling
- Scrotal skin is usually free
- Estimation of Alfa-feto-protein & Human chorionic
- gonadotrophin- Tumor markers
- Needle biopsy- contraindicated
- High orchidectomy with retroperitoneal lymph node dissection
- Pot op Radiotherapy or adjuvant chemotherapy



Inguinal Lymphadenopathy

- Look for any primary focus of infection or neoplasia in drainage area – from umbilicus to toes
- Most are due to reactive hyperplasia and responds to antibiotics
- Some may be due to Lymphoma
- In persistent cases always do excisional biopsy

Idiopathic Scrotal Edema

- **Introduction:**
  - Cause?
  - Peak age: 4-5 yrs
- **Presentation:**
  - Swollen, red scrotum
  - Minimal pain
- **Management:**

  Conservative, self limiting within 1-2 days

The End