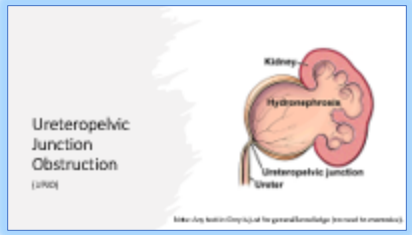
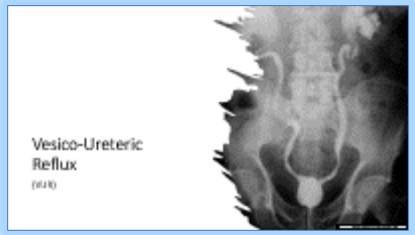
Principles of Pediatric Urology

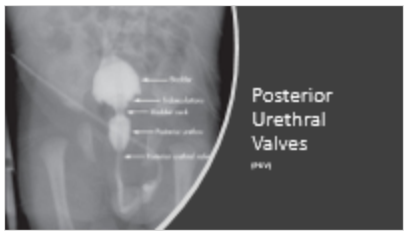
By Raed Al-Taher, M.D.

Topics in BLUE are the required ones

Urinary Tract Infection







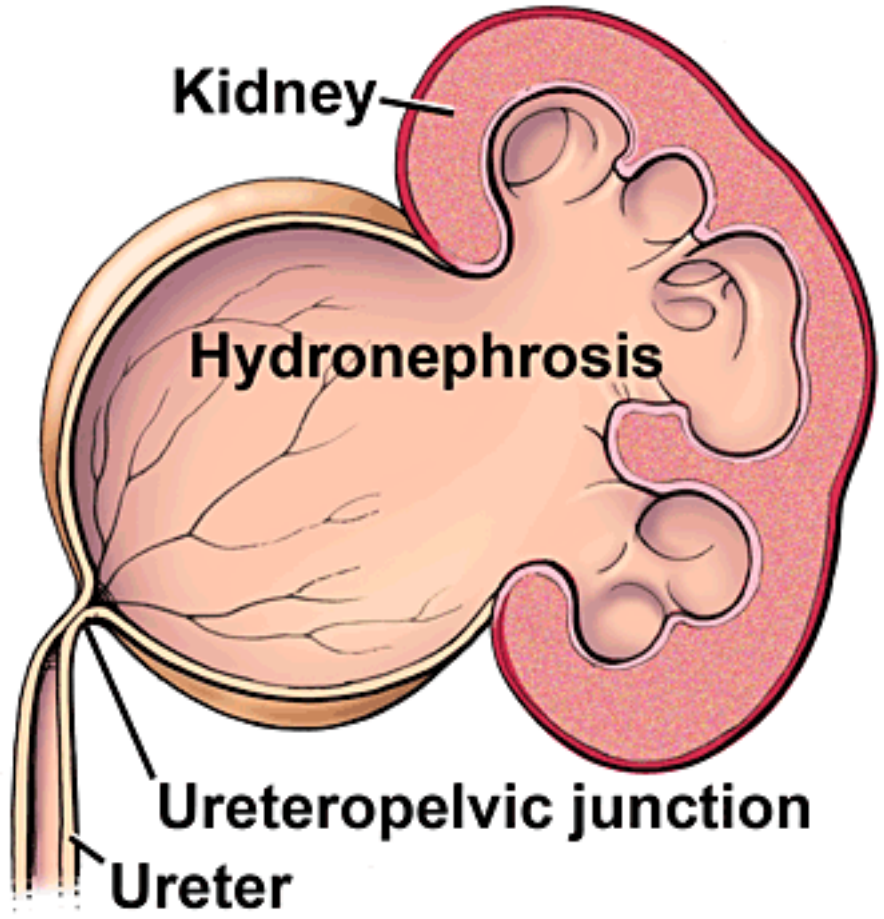
Megaureter

Neurogenic Bladder

Disorders of Sex Development

Ureteropelvic Junction Obstruction

(UPJO)



Note: Any text in **Grey** is just for general knowledge (no need to memorize).

Ureteropelvic Junction Obstruction (UPJO)

- M:F 2:1 | Lt:Rt 3:2 | bilateral 10–40%

- Most present as **HYDRONEPHROSIS** (HN) that is detected by **antenatal US**

Antenatal US

- Society of Fetal Urology (SFU)
  - Grade 0 – normal kidney
  - Grade 1 – minimal pelvic dilation
  - Grade 2 – greater pelvic dilation without caliectasis
  - Grade 3 – caliectasis without cortical thinning
  - Grade 4 – HN with cortical thinning

Etiology

- **Intrinsic**
  - **Intrinsic narrowing**
  - Rarely: mucosal valves, polyps, and true ureteric strictures

- **Extrinsic**
  - Aberrant renal vessel (~30% of UPJ, an artery directly enters the lower pole of the kidney).
  - Kinking as a result of severe vesicoureteral reflux (VUR).

Clinical Features

- Most are **asymptomatic** (detected via prenatal screening US)

- When symptomatic:
  - Flank or abdominal pain (~50%)
  - Palpable flank mass (~50%)
  - Hematuria
  - Recurrent UTIs (~30%)

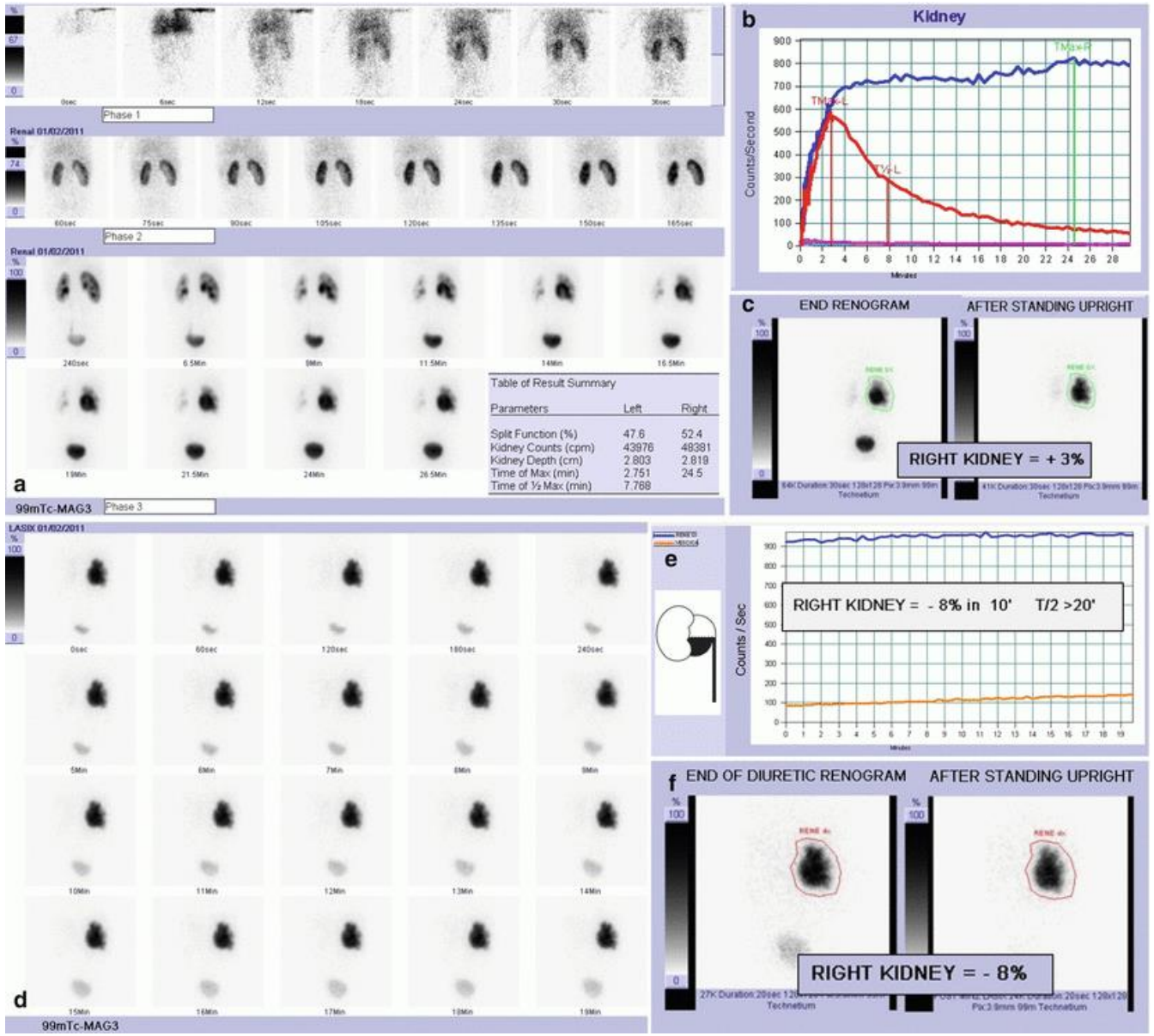
Investigations

- **Postnatal US**
  - The primary investigation tool for HN
  - Assesses kidney anatomy & AP diameter of renal pelvis

- **Renal radioisotope Scan**
  - MAG3 is the scan of choice, & shows:
    - Differential renal function
      - normally 50%:50%
      - acceptable down to 40%
      - needs intervention when <40%
    - Pelvic drainage curve
      - shows pelvic emptying (t½) after administration of furosemide
      - normally t½ <20 min
      - t½ >20 min = significant obstruction → needs intervention

- **MCUG**
  - To rule out whether HN is due to VUR

t½ = the time needed to drain half the urine amount from renal pelvis to the ureter



Obstructed kidney

Normal kidney

MAG-3 Dynamic Renal Nuclear Scan

Treatment

- **Antenatally detected HN**
  - Conservative management (follow up)
  - Surgery (needed in <50% of cases) when any or all of the following:
    - Functional deterioration (<40%)
    - $T_{1/2}$ > 20 minutes
    - Symptomatic

- **Surgery**
  - Open **OR** laparoscopic **pyeloplasty:**
    - Excision of the narrowed segment
    - Anastomosing ureter to the most dependent portion of the renal pelvis
    - Excision of redundant renal pelvis

- Endourological pyeloplasty
  - Use of balloon dilatations, percutaneous antegrade endopyelotomy, and retrograde ureteroscopic endopyelotomy.

Vesico-Ureteric Reflux

(VUR)

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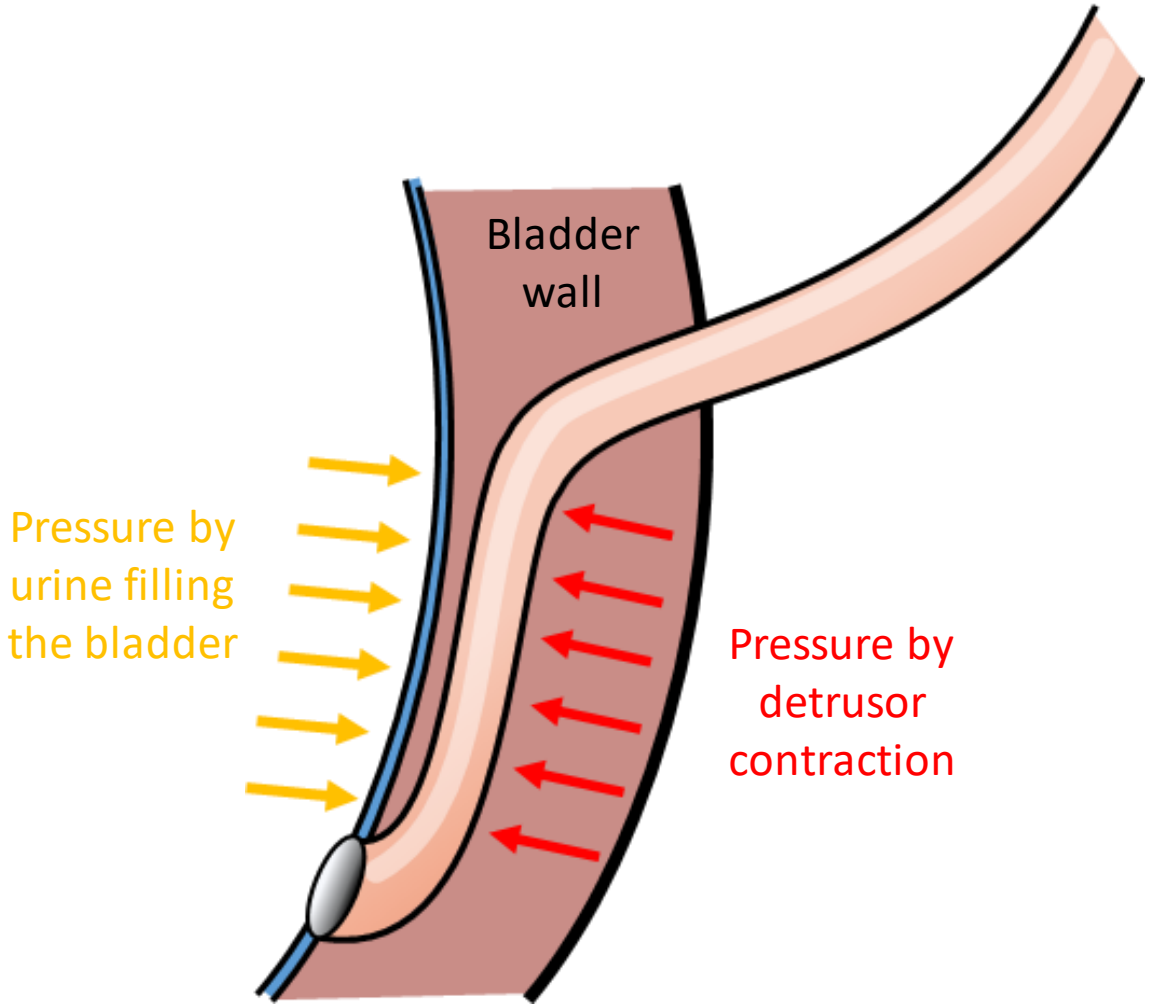
Vesico-Ureteric Reflux (VUR)

- Female predominant
- Peak incidence at 3 years
- Familial incidence is 2–4% of all cases

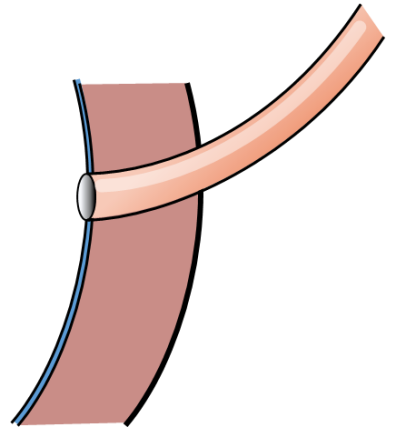
Normal ureteral submucosal tunnel



tunnel length : ureteral diameter → should be about 5:1 to prevent VUR

Pathology

- **Primary VUR:**
  - due to a **short ureteral submucosal tunnel** in the bladder wall



- **Secondary VUR:**
  - due to either:
    - Posterior urethral valve (PUV)
    - Neurogenic bladder (NB)
    - Anterior urethral valves
    - Ureteroceles
    - Bladder diverticula
    - Ectopic ureters associated with duplex system

Clinical Features

- Symptoms of UTI | **recurrent UTIs**
- **Renal scarring** (due to previous pyelonephritis – upper UTI)
- Renal dysfunction
- Hypertension
- Reduced somatic growth

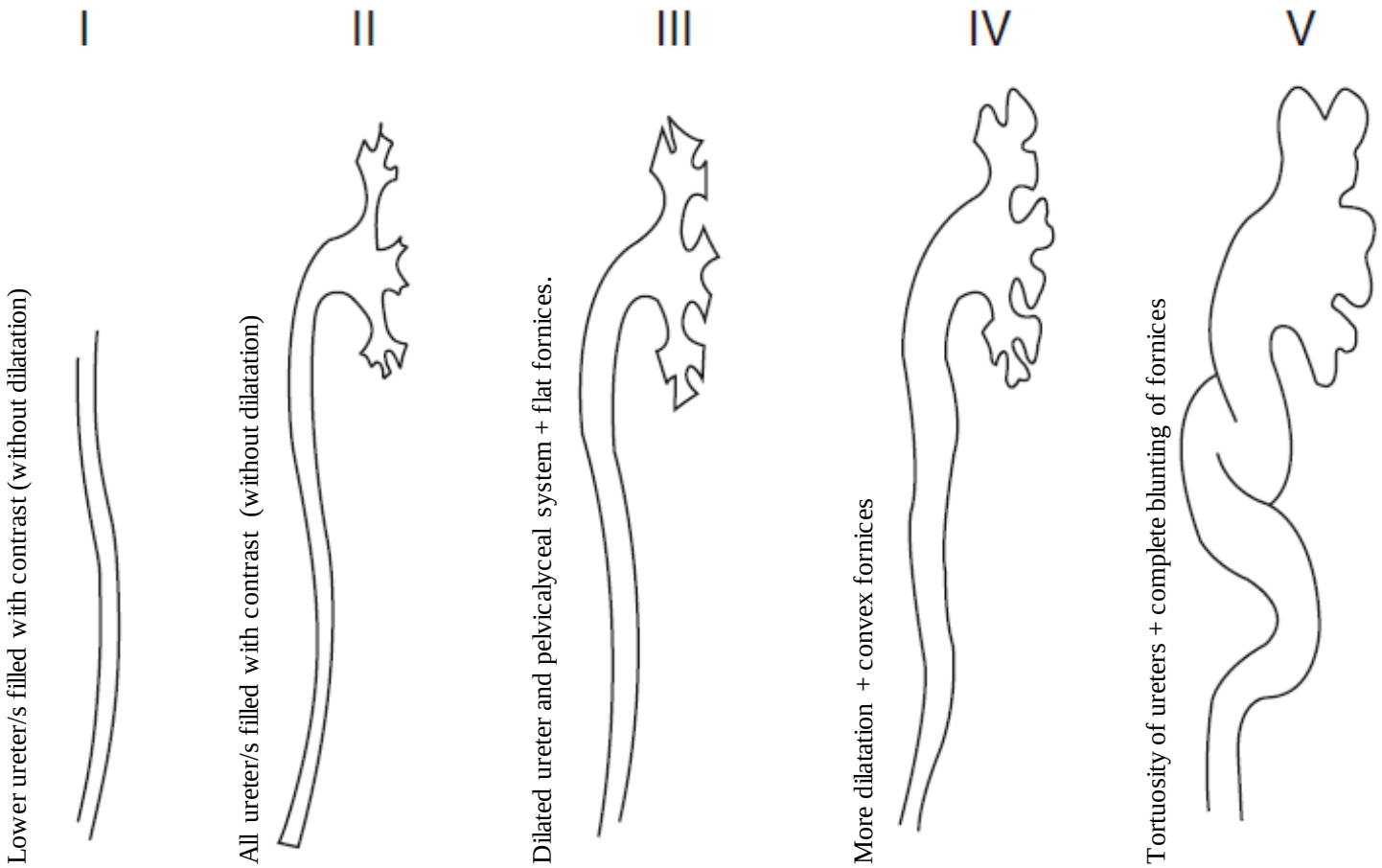
Investigations

- Urine analysis → r/o infection

- US → HUN (hydro-uretero-nephrosis)
- DMSA nuclear scan → for renal scars and differential renal function
- MCUG → for degree of VUR

- Direct isotope cystography (DIC) → for follow-up scans

MCUG | grading



Treatment

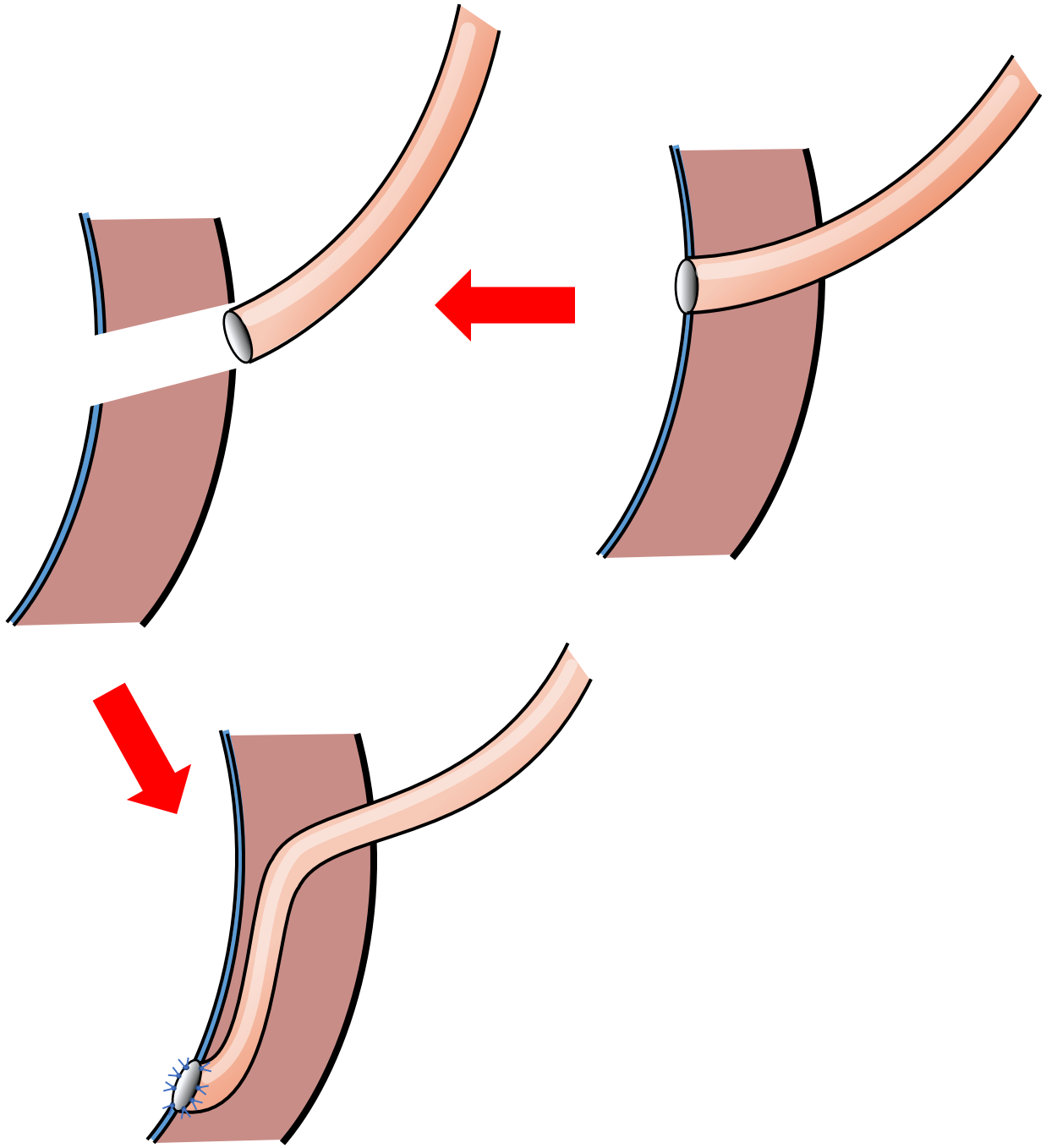
- **Low-grade reflux (I, II, & III):**
  - More likely to resolve spontaneously with age
  - Antibiotic prophylaxis
  - +/- Subureteral submucosal injection of bulking agent
    - Results better for lower grades of reflux (>80% success)
    - Less successful in children with neurogenic bladder (NB)

Surgical treatment

- **Indications:**
  - Failure of chemoprophylaxis and/or submucosal injection therapy
  - Deterioration of renal function &/or appearance of new scars
  - Secondary VUR (due to ureterocele, duplex ureter, PUV, or neurogenic bladder)
  - Higher grades VUR (IV, V)
  - Hypertension
  - Single kidney with higher grade of VUR
  - Decrease in renal growth or somatic growth

Surgical treatment

- **Reimplantation of ureters**
  - Transtrigonal ureteric (Cohen) reimplantation [most common]
  - Intravesical technique (Leadbetter–Politano)
  - Extravesical detrusorraphy technique (Lich and Gregoir)
  - ± Ureteric tapering or plication



Surgical treatment

Postoperative Management

- Antibiotics for ~3 months
- Follow-up VCUG or DIC

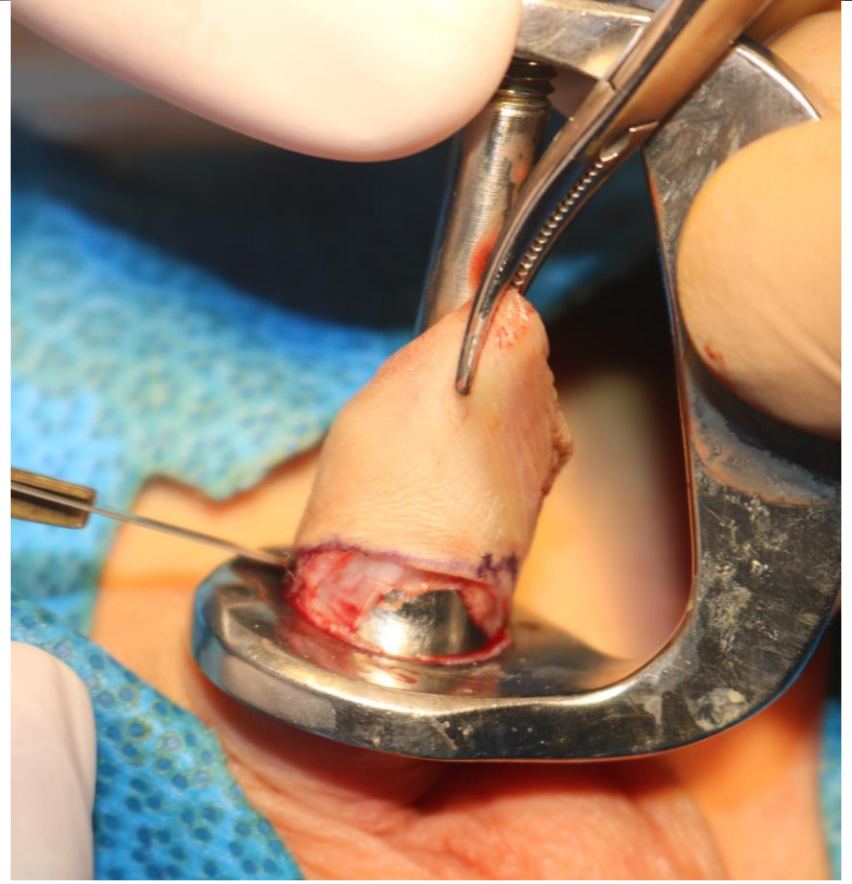
Complications

- Persistent reflux
- Ureteric obstruction (devascularisation, kinking or torsion)
- Intravesical calculi
- Injury to the bowel, fallopian tubes and/or vas deferens

Surgical treatment | Outcome

- success rate up to 98%
- corrects VUR..

→ however, does not reverse scarring nor parenchymal damage


Circumcision

الختان أو الطهور

Natural History of Foreskin Separation

- **At birth:**

Foreskin (prepuce) is adherent to the glans (non-retractable) (physiological phimosis)

- **At 2–4 years:**

dissolution of adhesions → foreskin can retract

- **At 5 years:**

most boys should have normal foreskin retraction

History

- An act of faith in both Jewish and Muslim religions:
  - Jewish: timing is important (8th day of life)
  - Muslims: timing is less important (tends to 1st 1-2 weeks of life)

- Not a necessary part of Christian faiths, though lots still encourage it.

Indications

- Religious or ritual preference
- Pathological phimosis
- Paraphimosis
- Recurrent UTI with no known underlying cause

Phimosis

- Foreskin is unable to be retracted to expose the glans.

Types:

- Physiological phimosis (normal state in first years of life)
- Pathological phimosis:
  - **Primary**: true congenital phimosis with pin-hole meatus.
  - **Secondary to**:
    - Bacterial infection:
      - **balanitis** (inflammation of the glans)
      - **posthitis** (inflammation of the foreskin)
    - Balanitis xerotica obliterans (BXO)

Phimosis | Management

- **Conservative**:
  - Reassure, gentle self-retraction
  - Topical steroids (e.g., betamethasone 0.1%)

- **Surgical options**:
  - Circumcision
  - Preputial “stretch” or -plasty

Paraphimosis

- Foreskin is able to be retracted but becomes stuck in that position

→ resulting in distal congestion and edema of glans

Paraphimosis | Management

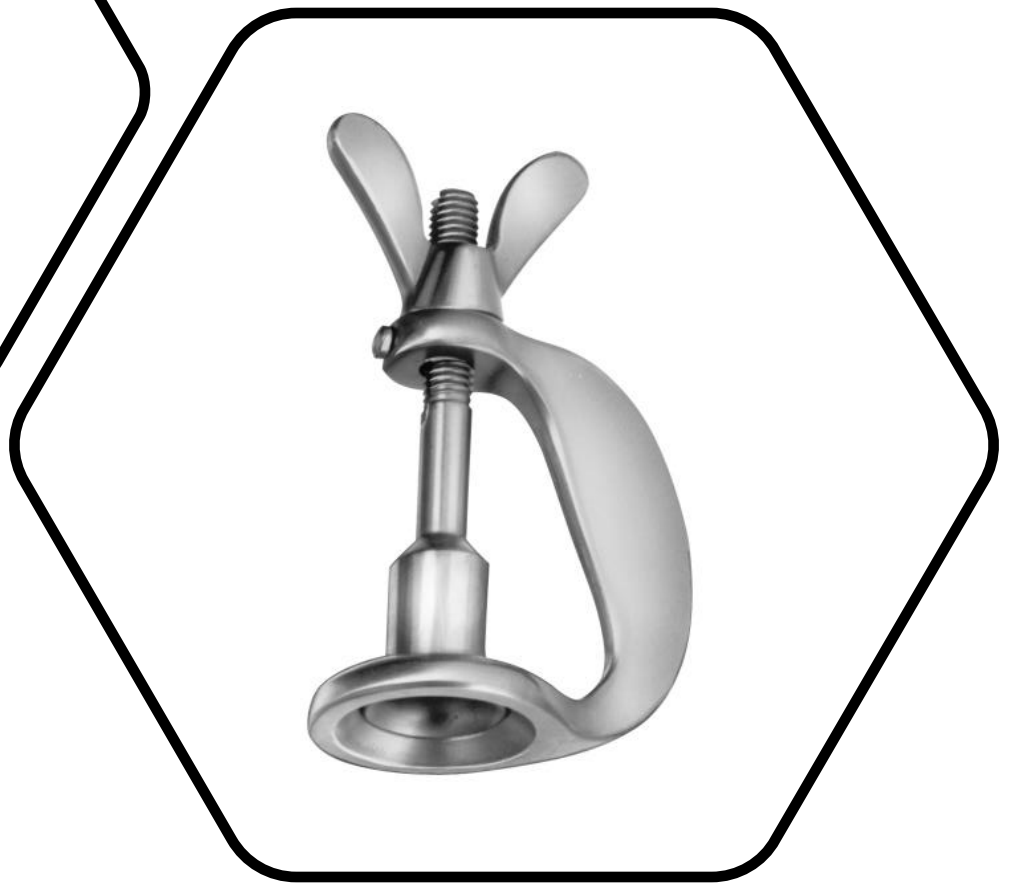
- **A surgical emergency**

- **Manoeuvres can be done in ER:**
  - Compresses with ice or sugar (to reduce the swelling and allow protraction)
  - Multiple needle punctures (to allow fluid to be squeezed out)

- if failed → send to OR

→ dorsal slit of the tight band +/- circumcision (under GA)

Circumcision



Surgical Freehand

Surgical using specific clamps

- Plastibell® | Gomko clamp® | Winkelmann clamp® | Mogen clamp

Circumcision

Contraindications

- **Absolute:**
  - Family history of bleeding disorders
  - The newborn has known bleeding tendency/disorder, or pathological jaundice

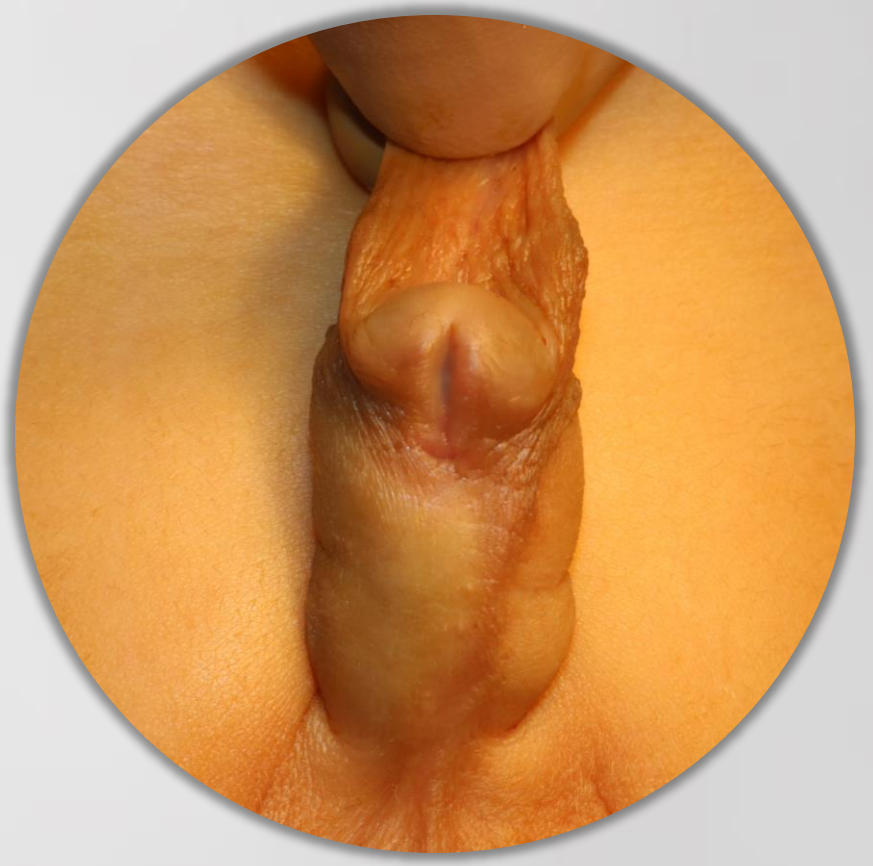
- **Relative:**
  - Hypospadias (as foreskin helps in the surgical repair of hypospadias)

Circumcision | Complications

- **Bleeding**
- Infection
- Meatal stenosis
- Insufficient/excessive foreskin removed
- Adhesions, skin bridges, or inclusion cysts
- Entrapped penis or secondary phimosis
- Urethral injury (iatrogenic hypospadias)
- Necrosis of the penis (injudicious use of electrocautery to control bleeding)
- Amputation of the glans (partial or complete)
- **Death** (mainly due to unnoticed bleeding)

Hypospadias

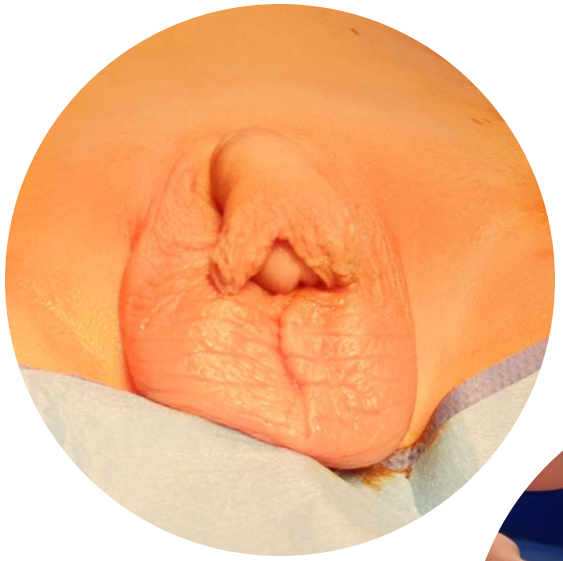
الإحليل التحتي أو الطهور الملائكي



Definition

A complex of..

- abnormal ventral urethral meatus
- dorsal hooded foreskin
- glans defect
- underdeveloped corpus spongiosum
- +/- phallic torsion
- +/- phallic ventral curvature (chordee)



Incidence

- Usually isolated
- Can be part of the DSD spectrum

- **One in 300 live-births**

- Associated with:
  - ↑ parity
  - ↑ maternal age
  - ↓ birth Wt
  - +ve family history
  - inguinal hernia & hydrocele (10%)
  - undescended testes (8%)

Etiology

Genetic Factors

- Exact mode of inheritance is unknown
- Monozygotic twins (x8)
- +ve family history (8% fathers | 14% brothers)

Endocrine Factors

- Deficient androgenic stimulation (production, conversion, or sensitivity)
- Increased maternal progesterone exposure (x5)

Environmental Factors

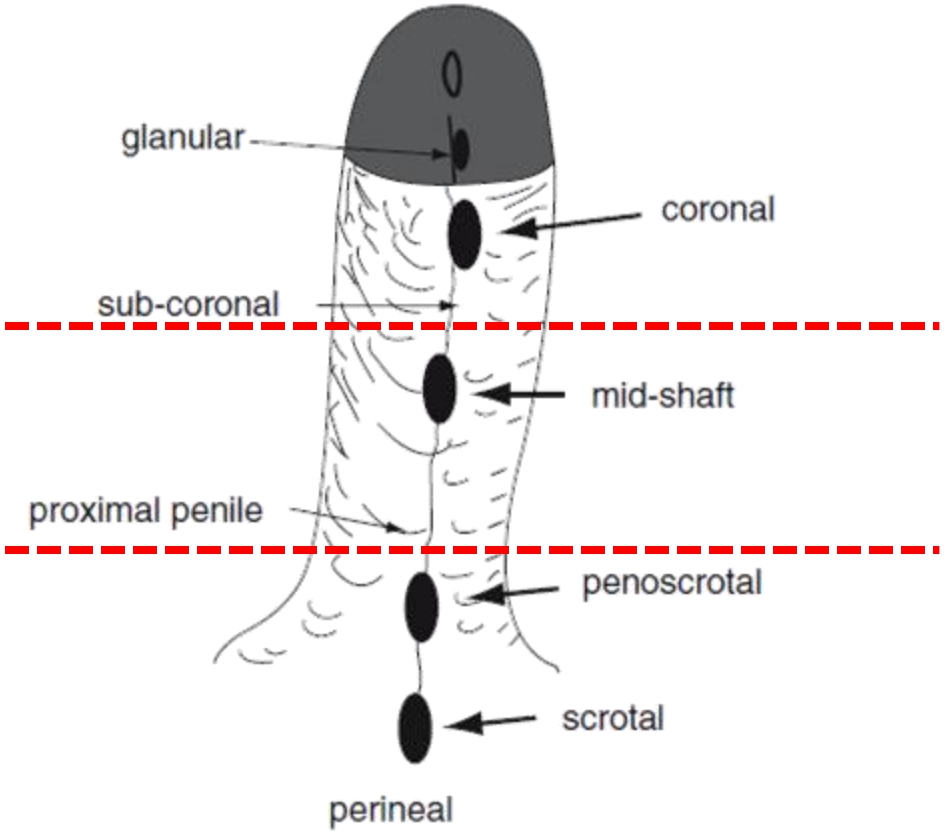
- Maternal exposure to estrogenic substances (in pesticides, milk, plastic linings of metal cans, and pharmaceuticals)

Classification

Distal (50%)

Middle (30%)

Proximal (20%)



Surgery

- **Best timing recommendation:**
  - before 18 months of age (minimizes psychological impact of genital surgery)

- **Hormone manipulation preoperative:**
  - penile size can be increased by..
    - weekly IM testosterone or hCG
    - or topical testosterone or DHT

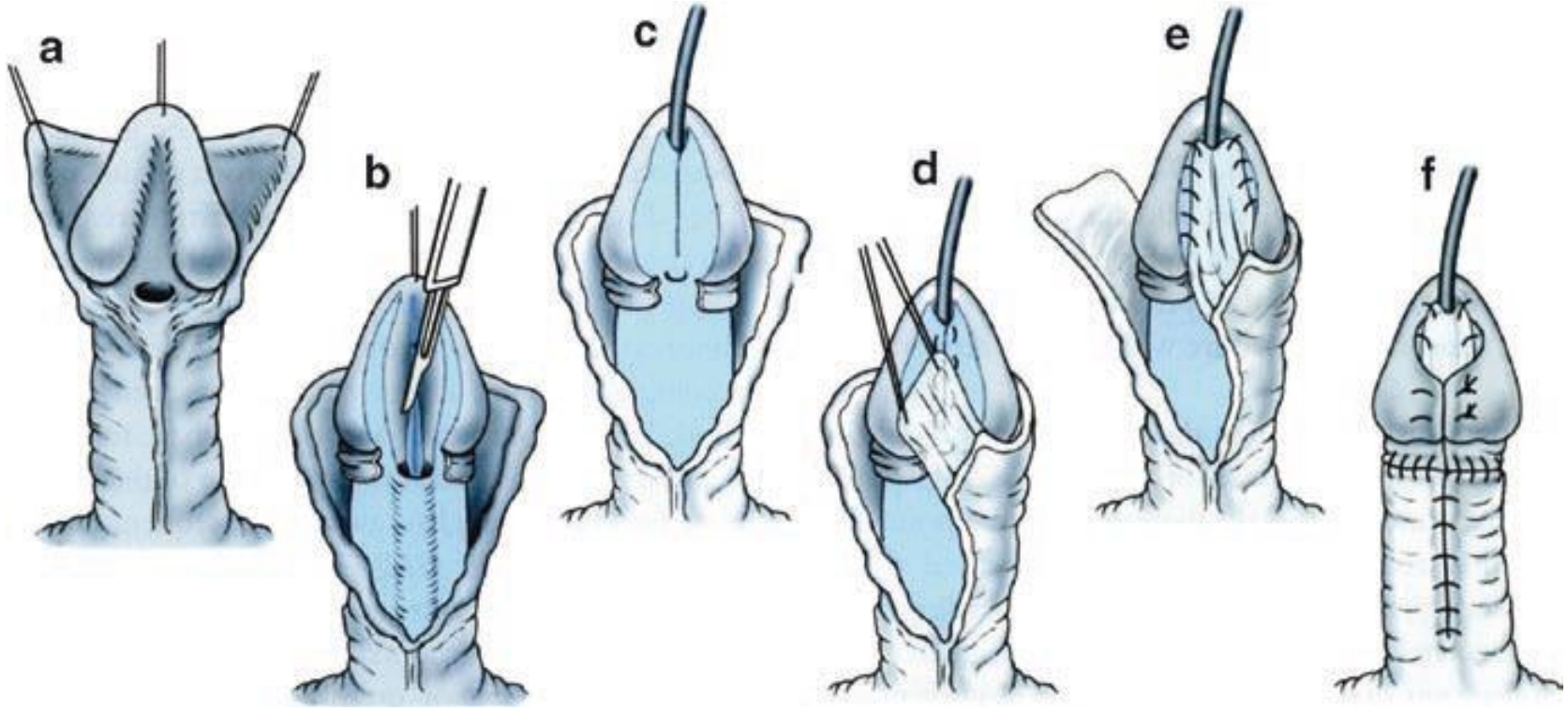
Surgery

Tube urethroplasty

urethral plate is tubularized to neourethra **[main step]**

+

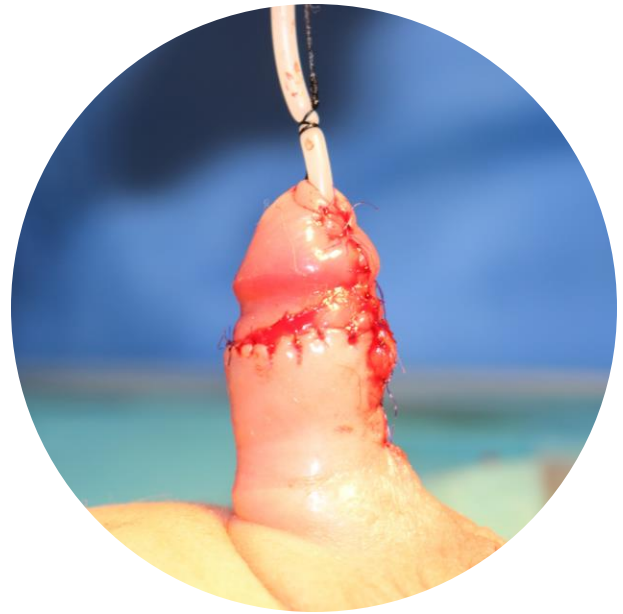
- **Corpus spongioplasty:** deficient corpus spongiosum is compensated by fascia (preputial or dartos fascia) to support the neourethra
- **Straightening phalloplasty:** chordee is released
- **Glansplasty:** glans defect is corrected
- **Circumcision:** dorsal foreskin is removed
- **Phalloplasty:** phallic torsion is corrected



Incised-plate tube urethroplasty “Snodgrass repair”

Adapted from Belman et al. (Belman AB, King LR, Kramer SA (eds) (2002) Clinical pediatric urology, 4th edn. Martin Dunitz, London, p 1077)

Postoperative care



- Neourethra is protected for 1 week with a “stent”
- Simple analgesics
- Oral antibiotic

- **Early complications:**
  - Bleeding
  - Hematoma
  - Infection
  - Breakdown of repair

- **Late complications:**
  - Meatal stenosis
  - Urethrocutaneous fistula (UCF)
  - Persistent chordee
  - Urethral stricture
  - Urethral diverticulum

Thank You