Urology 1

Symptoms and Investigations of Urinary Tract Diseases

Pain

- Pain in
  · Kidney · Ureter · Bladder
  · Posterior urethra · Anterior urethra
- Is differentiated according to:
  · Character · Site · Radiation

Hematuria

- **Definition:** Blood in urine.
- **Types:** according to
  - Amount:
    · Frank hematuria · Microscopic hematuria
    · Smoky urine
  - Relation to micturation:

Table 1-1 **Types of Hematuria according to relation to micturation**

Total hematuria	From kidney or bladder
Initial hematuria	From anterior urethra
Terminal hematuria	From posterior urethra or bladder neck

- **Differentiated from:**
  · Hemoglobinuria · Myoglobinuria
  · Beet Roots · Rifampicin
  · Jaundice
- **Causes:**
  - General causes: general causes of bleeding
  - Local causes:
    - Trauma - Tumors (cancer bladder)
    - Calculi - Infection (bilharziasis)
- **Diagnosis:**
  - History:
    - Source of blood
    - Associated symptoms
  - General examination:
    - Hypovolumia or pallor
    - Uremia or hypertension
    - Metastases or constitutional Manifestations
  - Local examination:

Table 1-2 **Local Examination in Hematuria**

Abdominal	External genitalia	Per rectal
· Renal angle: for mass, tenderness	· Blood · Discharge	· For prostate
· Suprapubic area	· Varicosities	

- **Investigations:**
  - Laboratory
    - Urine analysis -Kidney function tests
    - Blood picture
  - Radiological:
    - Plain X-ray & IVU: for stones
    - Ascending cystography: for bladder & prostate
    - Sonar & CT scan: most diagnostic
  - Cystoscopy
- **Treatment:**
  - Anti-shock
  - Stop bleeding by:
    · Vitamin K IV · Dicinon IM
  - Treat cause

Acute Retention of Urine

- **Definition:** Inability to pass urine inspite of full bladder.
- **Etiology:**
  - Obstructive:
    - Urethra:
      · Stone · Rupture · Urethritis
    - Prostate:
      · BPH · Cancer · Abscess
    - Bladder: bladder neck obstruction by:
      · Bilharzial fibrosis · Stone · Cancer · Clots
  - Post-operative:
    · Anal · Gynecological · Urethral
  - Neurological
    · Spinal cord injuries or diseases
  - Gynecological:
    · Cervical fibroid · Ovarian tumor
    · Retroverted gravid uterus

Table 1-3 **Differentiation Between Retention of Urine and Anuria**

	Retention of Urine	Anuria
Definition	Desire to micturate	No desire
Bladder	Full	Empty
Percussion on suprapubic area	Flow of urine	No flow
Sonar	For differentiation	

- **Treatment:**
  - Conservative: in postoperative causes
    - · Analgesics · Out of bed · Warm bath
    - · Parasympathomimetics except in BPH
  - Urethral catheter:
    - · If conservative failed · Foley's or Nelton
  - Suprapubic cystocatheter:
    - · If urethral catheter failed

Anuria:

- **Definition:** Absence of excretion of urine by the kidneys for 12 hours
  Normal urine flow 0.5-1 ml/Kg/hour
- **Causes:**
  - Pre-renal: hypovolumia ie. Systolic <70
  - Renal: Renal failure
  - Post-renal:
    - · Calculus anuria · Sulphonamide
    - · During hysterectomy · Cancer cervix

Calculus Anuria

- **Causes:**
  - Stone in one ureter of only functioning kidney (Most significant)
  - Stones in both ureters
- **Clinical picture:**
  - Symptoms:
    - Stage of onset:
      - · Sudden onset of ureteric colics
    - Stage of tolerance:
      - · Renal dull aching pain · Blood urea increases
    - Stage of uremia:
      - · Glomerular filtration stops
  - Signs:
    - · Early: tender kidney with guarding &rigidity
    - · Late: uremia
- **Investigations:**
  - Catheter: to exclude retention
  - Plain X-ray: not very helpful
  - Sonar: very helpful
  - Cystoscopy or uretroscopy
  - Kidney function
- **Treatment:**
  - Cystoscopy and bilateral ureteric catheters to drain urine, then later stone removed by uretroscope or surgically
  - Percutaneous nephrostomy tube:
    - · If uretric catheter failed
    - · To drain urine to be fit for anesthesia & surgical stone extraction

Congenital anaomalies of urinary tract

Polycystic kidney

- **Etiology:**
  Failed fusion between mesanephros & metanephros
- **Pathology:**
  - · Bilateral · Grape-like
  - · Cysts containing fluid or blood with normal parenchyma in between, not communicating with pelvis
- **Clinical picture:**
  - Symptoms:
    - Bilateral renal mass
    - Pain: heaviness, rupture cyst, stone
    - Hematuria 25%: due to pyelonephritis or rupture cyst
    - Pyelonephritis
    - Renal hypertension 75%: from separate gene
    - Uremia: late
  - Signs:
    - Lobulated bilateral mass - Uremia
- **Investigations:**
  - Laboratory:
    - Urine analysis - Kidney functions
  - Radiological:
    - IVU: spider leg appearance of calyces
    - Sonar: cysts, investigation of choice
    - CT scan with contrast & MRI
- **Treatment:**
  - Conservative:
    - · Low protein · **Anti**hypertensive · **Anti**biotics
  - Operation:
    - Rovsing's operation:
      Puncture of cysts to preserve parenchyma
    - Nephrectomy is contraindicated
  - Late: dialysis & transplantation

Ectopia vesica

- **Etiology:**
  Ventral defect in urogenital sinus leading to deficient anterior bladder wall
- **Types:**
  - Complete: in order
    - Umbilical (& inguinal) hernia
    - Absent anterior abdominal wall
    - Absent anterior bladder wall with protruded posterior wall & urine dripping
    - Separation at symphysis pubis
    - Small penis with epispadius & undescended testes (cleft clitoris)
    - Lax rectal sphincters
  - Incomplete:
    - Absent anterior abdominal & bladder walls ONLY
- **Complications:**
  - Recurrent UTI → uremia
  - Excoriation of skin
  - Cancer bladder
  - Electrolyte imbalance
  - Sterility
- **Treatment: options**
  - Urinary diversion: with later cystectomy
    Complications: metabolic abnormalities, renal infections, cancer sigmoid
  - Bladder reconstruction

Hypospadius

- **Definition:**
  - Urethra opens on under surface of penis
  - Because terminal urethra is incompletely developed, being replaced by chordee, so penis is curved down leading to:
    - Failure of intercourse
    - Ejaculation outside vagina
- **Classification:** according to location
  - Glandular
  - Coronal
  - **P**enile
  - **P**enoscrotal
  - **P**erineal
- **Pathology:**
  - Absent ventral prepuce, so circumcision **NOT** done
  - Repair is done before school age, after 2 years age
- **Treatment:**
  - Circumcision **NOT** done, for future reconstruction
  - Release chordee
  - Reconstruction of new urethra

Renal injuries

- **Etiology:**
  - Penetrating
  - Blunt: Direct, Indirect
- **Pathology:**
  - Early pathology:
    - Bruises
    - Hematomas
    - Tears
    - Laceration with hematuria
    - Injury of renal pedicle with retro or intraperitoneal hematoma
  - Late pathology (complications):
    - Hydronephrosis
    - Pseudo-hydronephrosis
    - Hematoma
    - A-V fistula
    - Renovascular hypertension
    - Uremia
- **Symptoms:**
  - **H**istory
  - **P**ain in renal area
  - **H**ematuria
  - **R**etro**p**eritoneal **h**ematoma
  - **R**etention
- **Signs:**
  - Hypovolumic shock
  - Localized grading & .....
  - Mass in flank
  - Complications
- **Investigations:**
  - Urine analysis: hematuria
  - Plain X-Ray:
    - Obliteration or renal & psoas shadow
    - Fracture
    - Ileus
  - IVU
    - Normal
    - Deformed PC system with lacerations
    - Extravasation of dye
    - Non vascularization indicates thrombosis or spasm
    - Function of other kidney
  - CT scan with contrast: investigation of choice
  - Renal isotope scanning: for parynchemal injury
- **Treatment:**
  - Conservative (for most cases):
    - Bed rest
    - Fluid & change pH
    - Antibiotics & analgesics
    - Follow up chart: by:
      - Vital signs
      - Mass & hematuria
      - HB
      - Investigations
  - Surgical treatment:
    - Indications:
      - **P**ersistent hematuria
      - **P**rogressively **en**larged **p**erirenal mass
      - **P**erirenal **in**fection
      - Intra**p**eritoneal **in**jury or shock
    - Principles:
      i. Transperitoneal approach
      ii. Vascular clamp
      iii. Accordingly:
        - Debridement
        - Suture
        - Evacuation
        - Partial or total nephrectomy

Rupture bladder

Table 1-4 **Intaperitoneal & extraperitoneal rupture of bladder**

	Intraperitoneal rupture bladder	Extraperitoneal rupture bladder
Etiology	**Blow or kick** to lower abdomen	**Fracture pelvis**
Site of rupture	Post. Part of apex	Ant. Wall
Extravasation of urine	**Intra**peritoneal	**Extra**peritoneal: · Retropubic · Perivesical · Deep extravasation
Clinical picture	Suprapubic pain **No** desire **Peritonitis**	Suprapubic pain **Desire** to micturate **Fracture** pelvis
Signs	**Septic** shock **No dullness** above pubis **Peritonitis** P/R: **localized** swelling in retrovesical pouch	**Hypovolumic** shock **Tender** swelling above pubis **Fracture pelvis** P/R: **generalized** swelling
Investigations	Cystoscopy: NO urine Ascending cystography: leak of dye · **Intra**peritoneal Sonar	Cystoscopy: NO urine Plain X-Ray Ascending cystography: leak of dye · **Extra**peritoneal Sonar
Treatment	· Anti-shock+urgent exploration · Open **peritoneum** & drain · Close the tear with suprapubic cystostomy tube · **Close peritoneum on drain** · Close wound with drain in cave of Ritzius	· Anti-shock+urgent exploration · Open **bladder extraperitoneal** · Close the tear with suprapubic cystostomy tube · **Manage fracture pelvis** · Close wound with drain in cave of Ritzius

Rupture urethra

Table 1-5 **Anterior & posterior urethra rupture**

	Anterior urethra	Posterior urethra
Etiology	Trauma to **peritoneum**	**Fracture pelvis** or instrumentation
Types	**Complete or Incomplete**	**Complete:** · Torn puboprostatic ligament · Displaced bladder & prostate
Extravasation of urine	Superficial perineal pouch→penis, scrotum→**superficial extravasation**	Suprapubic, perivesical space→**deep extravasation**
Clinical picture	**Perineal** pain	**Pelvic** pain
	Bleeding per urethra Retention & extravasation of urine	
		P/R: displaced prostate
	Stricture urethra	
Treatment	Patient: do NOT micturate Doctor: do NOT catheter Cystostomy Cystourethrography	
	Treatment of **extravasation**: · Cystostomy+antibiotics+drainage	Treatment of **fracture pelvis**
	For stricture urethra: · Endoscopic dilatation · reconstruction	

Urinary Calculi

▪ Etiology:

- Primary:
  - Dietetic: vitamin A deficiency
  - Altered urinary solutes and colloids:
  - Increased concentrations
  - Decreased colloids & mucoproteins
  - Decreased urinary citrates
  - Prolonged immobilization
  - Hyperparathyroidism, hypercalcemia, gout, cancer chemotherapy
  - Cystine & xanthine stones: hereditary
- Secondary:
  - Infection:
    - By E.coli, Proteus, Klebsiella
  - UT obstruction

▪ Types of urinary calculi:

- Calcium oxalate: commonest
  - Sharp projections, causing pain & hematuria
  - In alkaline urine
- Magnesium ammonium phosphate:
  - Stag-horn stone
  - In alkaline urine
- Urate stones:
  - Faceted
  - In acidic urine
- Cystine stones
- Xanthine stones

▪ Complications:

- Hematuria
- Infection
- Calculus anuria
- Malignancy (rare)
- Hydronephrosis
- Impaction causing retention
- Migration

▪ Clinical picture:

- Silent: Most significant
- Pain
- Complications

▪ Investigations:

- Laboratory:
  - Urine analysis
  - Kidney functions
  - Electrolytes related
- Radiological:
  - Plain X-Ray: radiopaque shadows
  - IVU & ascending cystography
  - Sonar
- Cystoscopy & uretroscopy

I. Renal stones:

- Plain X-Ray: Differential diagnosis of radiopaque shadows in right hypochondrium:
  - Gall stones: lateral view
  - Calcified:
    - Costal cartilage
    - Chip fractures
    - Renal TB
    - Suprarenal gland

II. Uretric stones:

- Origin:
  - Descending
  - Uretric (date)
- Sites: at natural narrowing (3 sites)
- Plain X-Ray: shadow along course of ureter

III. Urinary bladder stones:

- Origin:
  - Descending
  - In bladder
- Symptoms: as before +
  - Frequency diurnal then both
  - Terminal hematuria
  - Interrupted stream

IV. Urethral stones:

- Origin:
  - Mostly migratory
  - Less commonly primary
- Clinical picture:
  - History of colics
  - Interruption of stream
- Plain X-ray: ant. Or post. Urethra in relation to symphsis pubis
- Urethroscope
- Ascending urethrography

▪ Treatment of urinary tract stones:

I. Colics:

- Hospitalization
- Analgesics, anti-inflammatory, antibiotics
- Fluids & diuretics
- Change pH

II. Elective:

- Conservative:
  - Fluid
  - Diuretics
  - Antiseptics
  - Change pH
  - Follow up every 4 weeks
- ESWL: indicated in
  - Hematuria
  - Colics
  - Failure
  - Fever
- PCNL:
  - Direct removal through nephroscope
  - Advantages: small wound, mild PO pain
  - Complications: injury, bleeding, fistulae, residuals
- Open surgery:
  - Incision: Morrison's
  - Options:
    - Pyelolithotomy
    - nephrolithotomy
    - pyelonephrolithotomy
    - Partial or total nephrectomy

Table 1-6 **Treatment of renal stones**

Medical treatment		ESWL	PCNL	
Indications	**Contraindications**	**Contraindications**	**Indications**	**Contraindications**
Less than 2 cm	Larger than 2 cm	Large stones Lower calceal stones	Large stones >2 cm Lower calceal stones	
No evidence of infection Obstruction Back pressure	Evidence of infection Obstruction Back pressure	Renal infection Renal insufficiency Obstruction	Renal infection Renal insufficiency Obstruction ESWL failure	
	Hematuria Persistent pain Growing stones	Pregnancy Spine deformities Bleeding tendency		Pregnancy Spine deformities Bleeding tendency
		Complications	**Complications**	
		Hematuria Colics Failure Fever	Bleeding Injury Fistulae Residual stones	

Table 1-7 **Management of urinary stones**

	Renal stones	Uretric stones	Bladder stones	Urethral stones
Conservative	✓	✓	✓	✓
Instrumental	ESWL	Uretroscopy ESWL	< 2cm · Lithotrite · US waves	Post. Urethra: Dislodge by catheter Ant. Urethra: Removed by forceps, NOT open on
	PNL			
	Combined ESWL & PNL			
Surgery		Urethroscopy	Cystolithotomy · >2cm · Failure of insertion · Diverticulum · B. neck obstruction	

III. Metabolic work-up to prevent recurrence:

- Chemical analysis of stone & biochemical investigation:
  - Serum: Ca &P
  - 24 h urine: for Ca, uric acid, oxalate, citrate

Table 1-8 **Metabolic work-up for different urinary stones**

Ca oxalate S	Uric acid S	Phosphate S
Citrates	Allopurinol	Aluminium hydroxide & antibiotics
Vitamin C	Na HCO_3	Vitamin C
Avoid diet rich in		

HYDRONEPHROSIS

- **Definition:** chronic aseptic dilatation of renal pelvis & calyces with thinning out of renal parenchyma due to partial or intermittent obstruction of urinary tract
- **Pathophysiology:**
  - Obstruction → increased pressure → compensatory hypertrophy
  - Then decompensated atony → compression & atrophy of paryncheme → thin walled sac filled with clear fluid
  - GFR stops → uremia
- **Etiology:**
  - **U**nilateral: · **U**retric: obstruction
  - **B**ilateral:
    - · **P**rostate: cancer or enlargement
    - · **B**ladder: cancer
    - · **R**etro**P**eritoneal: tumor or fibrosis
    - · **R**eflux
- **Pathology:**
  - Renal calyces:
    1. Broadened 2. Flattened 3. Clubbed 4. Balloned

- Renal parynchema: Pressure atrophy

- **Clinical picture:**
  - · **P**ain: in loin · Swelling: in renal angle
  - · **P**olyuria with low SG
- **Complications:**
  - · Infection · **R**upture
  - · Stone · **R**enal failure & HTN
- **Investigations:**
  - Urine analysis - Kidney functions
  - Sonar: investigation of choice. For size & thickness
  - IVU:
    - · **D**ilatation · **D**istension
    - · **D**elayed extraction
  - Ascending pyelography: if renal failure
  - Renal isotope scanning
- **Treatment:**
  - Removal of obstruction: in early cases
  - Reconstruction (Anderson-Hynes operation): in moderate cases
  - Nephrectomy: in advanced cases

Benign Prostatic Hyperplasia

- **Incidence:** old males
- **Etiology:** unknown but hormonal imbalance between estrogen & testosterone
- **Pathology:**
  - Site: median or lateral lobes (periurethral zone)
  - MP: epithelial hyperplasia, stromal hypertrophy
- **Complications:**
  - Urethra:
    - · Elongated · Compressed & tilt · Kink
    - · Urine retention: acute or chronic
  - Urinary bladder:
    - · Trabeculation of the wall · Pulsion diverticulum
    - · Retention with overflow · Infection & stones
    - · Vesical piles & hematuria
  - Ureter & kidney: back pressure
- **Symptoms:**
  - Uncomplicated cases:
    - Frequency:
      - · Nocturnal then nocturnal & diurnal
      - · Mechanisms: in order
        Exposure of prostatic urethra
        Inadequacy Atony
    - Difficulty in micturation:
      - · To start: hesitancy
      - · To maintain: weak stream
      - · To finish: residual urine
    - Sexual symptoms: increased libido then impotence
  - Complicated cases
- **Signs:**
  - General:
    - · **E**vidence of uremia · **E**ffect of straining
  - Abdominal:
    - · Renal **mass** · Suprapubic **mass**
  - Per rectal: 5Ss
- **Investigations:**
  - Urine analysis & kidney functions
  - IVU:
    - · Filling defect in the bladder base · Residual urine
    - · Hydronephrosis or diverticulum
  - Urine flowmetry: <15ml/sec indicates obstruction
  - Trans-rectal sonar: investigation of choice
    - · To assess size · To take biopsy
  - Prostate specific antigen
  - Cystoscopy: for hematuria
- **Treatment:**
  - Medical treatment:
    - Watchful waiting: follow-up, avoid 4 Ws
    - Drugs:
      - · 5 alpha blockers: improve frequency
      - · 5 alpha reductase inhibitors: reduce gland size, taken for life
  - Surgical treatment:
    - Indications:
      - · **D**istressing frequency · **D**ifficult micturation
      - · Acute **retention**: more than one attack
      - · Chronic **retention**: with residual urine, more than 100-200 ml
      - · Complications
    - Procedures:
      1. Endoscopic surgery:
         i. Trans-urethral resection (TUR):
            Removal of prostate by trans-urethral piece
         ii. Visual-laser or cryo-ablation of prostate:
            No hematuria but incomplete removal
      2. Open surgery:
         i. Trans-vesical prostatectomy:
            Adenoma is enucleated through the bladder neck
         ii. Retro-pubic prostatectomy (Millin's prostatectomy):
            Adenoma is enucleated through the retro-pubic space without opening bladder
    - Complications of surgery:
      - · Retrograde ejaculation · **I**mpotence
      - · **In**continence · **In**fection
      - · Bleeding
      - · TUR syndrome: dilutional hypovolumia

Renal cell carcinoma

- **Incidence: old males**
- **Predisposing factors:**
  - Smoking
  - Von-Hipple landau disease
  - Chromosome 3 change
- **Pathology:**
  - Site: upper pole
  - Gross picture:
    - Size: variable
    - Shape
    - Cut section:
      - Golden yellow color
      - Hemorrhage & necrosis
  - Microscopic picture: adenocarcinoma
    - Clear cell type
    - Granular cell type
  - Spread:
    - Direct: to renal pelvis, fascia
    - Lymphatic: to hilar LNs→paraortic LNs
    - Blood: Cannon balls
  - Complications:
    - Hematuria
    - 2ry varicocele
    - Pathological fractures
    - Malignancy
  - Staging: Robson system:
    - Stage I: limited
    - Stage II: to fascia & fat
    - Stage III: to renal pelvis+/-LNs
    - Stage IV: distant metastasis
- **Clinical picture:**
  - Typical presentation:
    - Hematuria: total, painless
    - Pain:
      - Stretch of capsule
      - Colics form clots
      - Infilteration of lumbar nerves
    - **Renal mass: hard, irregular**
  - Atypical presentation:
    - Weight loss
    - 2ry varicocele
    - Paramalignant syndrome: hyperuricemia, polycythemia, nephritic syndrome
- **Investigations:**
  - Laboratory:
    - Urine: maliganat cells
    - Kidney functions
  - Radiology:
    - IVU: shows
      - Kidney: enlarged
      - Calyx: elongated
      - Pelvis: displaced
    - CT scan with contrast: for
      - Invasion
      - Biopsy
      - Renal thrombus
    - Work up
- **Differential diagnosis:**
  - **Hydro**nephrosis
  - Poly**cystic** kidney
  - Perinephric **abscess**
  - Renal **TB**
  - Suprarenal **tumors**
  - Retroperitoneal **tumors**
- **Treatment:**
  - Operable: I, II

    Radical nephrectomy:
    - Removal of: kidney, gland, fascia, fat, nodes, 1/3 ureters
    - With anterior approach:
      - **E**asy delivery
      - **E**arly legation of pedicle
      - **E**xploration
      - Thrombectomy
  - Inoperable: III, IV

    Palliative nephrectomy

    Radio & chemo therapy

Wilm's tumor

- **Incidence:**
  - Children
  - Equal sex
- **Pathology:**
  - Origin:
    - Embryonic nephrogenic mesodermal stem cells
  - Site: Upper pole, may be bilateral
  - Gross picture:
    - Cut section:
      - Grayish white
      - Hemorrhage & necrosis
  - Microscopic picture: 2 types of cells: Epithelial & connective tissues
  - Spread: the same but late invasion of renal pelvis
- **Clinical picture:**
  - **Abdominal** mass: main presentation
  - Microscopic **h**ematuria
  - Vague **abdomina**l pain
  - **H**ypertension
- **Differential diagnosis of renal swelling in children:**
  - Neuroblastoma
  - Hydronephrosis
  - Poly**cystic** kidney
  - Multi**cystic** dysplastic kidney
- **Investigations:**
  - Laboratory:
    - Urine analysis
    - Kidney functions
  - Radiological:
    - IVU
      - Kidney: enlarged
      - Pelvi-calyceal system: attenuated
    - Sonar & CT scan: investigation of choice
    - Work up
- **Treatment:**
  - Radical nephrectomy
  - If unresectable, chemotherapy then nephrectomy
  - For residuals, chemo or radiotherapy

Table 1-9 **Renal neoplasms**

	Hypernephroma	Wilm's tumor
Incidence	Old males	Child, equal sex
Pathology		
Gross	Golden yellow in cut section Variable in size	Grayish white in cut section Usually huge
Microscopic	Origin: proximal renal tubules 2 types of cells: · Clear cell type · Granular cell type	Origin: embryonic nephrogenic mesodermal stem cells 2 types of cells: · Epithelial tissue · Connective tissue
Spread	Early invasion of renal pelvis	Rare & late invasion of renal pelvis
Clinical picture		
Main presentation	Painless hematuria Painless frank hematuria Renal mass in 30 %	Abdominal mass Microscopic hematuria Renal mass in 90%
Investigations	The same	
DD	Hydronephrosis, polycystic kidney	
	Abscess, TB, tumors	Neuroblastoma, multicystic dysplastic kidney
Treatment	· Operable: radical nephrectomy · Inoperable: palliative nephrectomy, chemo & radiotherapy	· Radical nephrectomy OR · Chemotherapy then nephrectomy

Table 1-10 **Cancer bladder**

	Squamous cell carcinoma (bilharzial)	Transitional cell carcinoma (Non bilharzial)
Incidence	**Young** males	**Old** males
Predisposing factors	- NH3 producing organisms 2ry to bilharzial cystitis - ↑ B-glucoronidase enzyme - Abnormal tryptophan metabolism	- **C**arcinogens industrial - **C**igarette smoking - **C**hemotherapy for cancer - **P**elvic irradiation for cancer - **P**henacetin - sweeteners
Precancerous lesions	· Squamous metaplasia . Leukoplakia	· Ectopia vesica · Vesical papilloma · Urachal diverticulum
Site	Lateral & posterior walls **NO** trigone	Lateral & posterior walls **Trigone** in 40 %
Gross	Commonest is **fungating nodular**	Commonest is **papillary tumor**
Microscopic	- **Squamous** carcinoma · Nests of epithelial pearls	- **Transitional cell** carcinoma · Superficial TCC · Muscle invasive TCC - Adenocarcinoma in 5 %
Spread	**Limited** due to fibrosis & calcification	
		Direct: to surrounding Lymphatic: to prevesical→internal iliac→paraortic Blood
Complications	· Uremia · Obstruction · Malignancy	
Symptoms	**Insidious** onset with Recent aggravation Total hematuria, Necroturia Pain from cystitis is **early**	**Acute** onset Total painless hematuria, Necroturia Cystitis is **late**
Signs	· General: uremia · Abdominal: suprapubic or renal mass · P/R: extent of tumor & LNs	

- Wallace classification:
  - T0: CIS
  - T1: palpable mass with NO induration
  - T2: palpable mass with induration
  - T3: extravesical spread +/- LNs
  - T4: fixed mass + distant metastasis

- **Investigations:**
  - Laboratory: Urine analysis, Kidney function tests
  - Radiology:
    - Plain X-Ray:
      · Eaten calcification · Tumor shadow

- IVU:
  · Filling defect · Kidney function
  · Hydronephrosis
- Sonar & CT scan with contrast: investigation of choice, for
  · The mass · Bone & renal affection · LNs

• Instrumental:
- Cystoscopy & biopsy: investigation of choice, for invasion

• Work up

▪ Management:

• Squamous cell carcinoma:
- Total radical cystectomy + urinary diversion:
  · In males: Remove bladder, prostate, seminal vesicles, lower ureters
  · In females: Remove bladder, uterus, tubes, Anterior vaginal walls
- Iliac LNs dissection

• Transitional cell carcinoma:
- Superficial TCC:
  · Transurethral resection OR · Laser OR
  · Intra-vesical chemotherapy
  Then follow up for 5 years
- Muscle invasiveTCC:
  · Partial cystectomy: if small
  · Radical cystectomy
  · Chemotherapy: responsive
  · Radiotherapy: less successful

CARCINOMA OF PROSTATE

▪ Incidence:

Commonest malignancy in males above 65 years

▪ Predisposing factors:

· Family history · Race

▪ Pathology:

• Site: posterior lobe

• Gross: Irregular nodule

• Microscopic:

· 95% adenocarcinoma · 5% transitional cell carcinoma

• Spread:
- Direct: To seminal vesicles, Rarely to rectum
- Lymphatic: To internal & external iliac → paraortic LNs
- Blood:
  90% to bones (lower lumbar vertebrae, pelvis, neck femur), Osteoblastic

• Complications:
  · Malignancy · Retention
  · Back pressure · Bone metastasis

• TNM staging:

Table 1-11 **TNM staging of cancer prostate**

T=Tumor	N=lymph Nodes	M=Metastasis
T0: NO clinical abnormality	N0: NO LNs	M0: no metastasis
T1: by needle biopsy	N1: mobile regional LNs	M1: distant metastasis
T2: T2a: one lobe T2b: > one lobe	N2:fixed regional LNs	
T3: to seminal vesicles	N3: paraortic LNs	
T4: pelvic spread		

• Gleason system:

Table 1-12 **Gleason system for cancer prostate**

Grade I	Small acini	Minimal nuclear changes	
Grade II	↑ size of acini		
Grade III	Variation in size of acini		Infiltration
Grade IV		Marked atypical cells	Extensive infiltration
Grade V		Undifferentiated cells	

▪ Clinical presentation:

- Pathological surprise: diagnosed clinically as BPH
- Urinary obstruction: short history in a male > 65 years
- Metastasis first presentation: backache
- P/R: opposite 5Ss of BPH

▪ Investigations:

• Laboratory:
- Tumor markers:
  · Prostate specific antigen: if >10 ng/ml
  · Acid phosphatase enzyme: increased in 70% of cases but non specific
  · Alkaline phosphatase: increased in metastasis
- Kidney functions

• Radiological:
  · Plain X-Ray: for bone metastasis · Bone scan
  · CT scan pelvis: for LNs
  · Transrectal sonar & biopsy: investigation of choice
  · Cystography: irregular filling defect

▪ Treatment:

Table 1-13 **Treatment of cancer prostate**

Method	Indications	
Radical prostatectomy	Early localized lesion	Surgically fit
Brachytherapy	Early small localized lesion	
	Advanced lesion	Surgically unfit
TUR	Urinary obstruction	Surgically unfit
Hormonal therapy	Majority of cases	
NO treatment	Small tumors in old age	

• Hormonal therapy: androgen-sensitive tumor
  · Bilateral orchidectomy · LHRH agonist
  · Anti-androgen · Stilbesterol · CCP
- Reconstruction of new urethra

Inflammation of urinary tract

Pyonephrosis

- **Definition:** Septic dilatation of pelvicalyceal system
- **Etiology:**
  - Primary: simultaneous infection & obstruction
  - Secondary: infection on top of obstruction
- **Pathology:**
  - Multilocular cavities contain ing pus
  - Perinephritis & adhesions
  - Primary pyonephrosis: **NOT** markedly enlarged kidney
  - Secondary pyonephrosis: **markedly** enlarged kidney
- **Clinical picture:**
  - Aching loin pain
  - Tender loin swelling
  - Fever: low up to high
  - Pyuria
- **Investigations:**
  - Laboratory:
    - Urine analysis
    - Kidney functions
    - CBC: ↑ WBCs
  - Radiological:
    - IVU: delayed excretion of dye
    - Ascending pyelography: for
      - Dilatation (degree)
      - Obstruction (level)
    - Sonar & CT
  - Cystoscopy: for cystitis & pus reflux
- **Treatment:**
  - Obstructed pyonephrosis: urgent nephrostomy, antibiotics then treat obstruction
  - If the other kidney is:
    - Healthy: nephrectomy of diseased one
    - Diseased: permanent nephrostomy of diseased one

Bilharziasis

- **Incidence:**
  - Young male
  - Mainly due to S.hematobium
- **Pathological changes in the bladder:** depends on duration
  - Bilharzial pseudo-tubercles: chronic inflammation around ova
  - Bilharzial nodules: fused tubercles
  - Bilharzial granulomas: aggregated nodules
  - Sandy patches: calcified dead ova
  - Ulceration: sloughed mucosa or papilloma
  - Fibrosis: due to 2ry infection causing BNO
  - Carcinoma: if neglected
- **Complications:**
  - **S**econdary bacterial infection
  - **S**tone formation form stasis
  - **S**tricture lower urethra
  - **S**pread to prostate, ...
  - **C**ontarcted calcified **bladder**
  - **C**ancer **bladder**
  - **B**NO
  - **B**ack pressure
  - Vesico-ureteric reflux
- **Clinical picture:**
  - Terminal hematuria: by extruded ova
  - Frequency & difficult micturation
  - Complications
  - Suprapubic pain
- **Investigations:**
  - Urine analysis: for ova, RBCs
  - Plain X-Ray & IVU: for calcification & back pressure
  - Cystoscopy: for extent & biopsy
- **Treatment:**
  - Medical: Main line of treatment
    - Anti-bilharzial, antibiotics
  - Surgical:
    - Polyps: cystoscopic removal
    - BNO: cystoscopic wedge excision
    - Ulcers: cystoscopic diathermy
    - Contracted bladder: augmentation ileo-cystoplasty

الحمد لله

2 Orthopedics

Scheme for fractures

Clinical picture of fractures

1. History of trauma
2. Loss of function (movement)
3. Pain
4. Tenderness
5. Swelling: from bone ends, hematoma, edema
6. Abnormal mobility & crepitus (NOT elicited)
7. DEFORMITY: VARIABLE ACCORDING TO FRACTURE

Investigations for fractures:

X-Ray:

- 2 views: AP & lateral
- 3 times:
  1. At onset: for diagnosis
  2. Post-reduction film: for reduction
  3. At end of treatment: for union

NB | Types of displacement:
- Lateral displacement
- Angulation
- Overriding
- Distraction
- Impaction

Complications of fractures

- **General complications: (in fracture spine, pelvis, and femur ONLY)**
  - Shock
  - Hemorrhage
  - Fat embolism
  - Crush syndrome: renal failure & arrhythmias
  - Tetanus
  - Paralytic ileus: due to RP hematoma & sympathetic
  - Prolonged recumbency:
    - DVT & pulmonary embolism
    - Respiratory complications
    - Constipation
    - Urinary stones
    - Joint, muscle
    - Bed sores

- **Local complications:**
  - Skin: infection
  - Muscles: MYOSITIS OSSIFICANS
  - Vessels:
    - Ischemia & gangrene
    - VOLKMANN'S ISCHEMIC CONTRACTURE
  - Nerve
  - Bone: Malunion, delayed union, NON union
  - Joint:
    - Hemoarthrosis
    - Osteoarthritis
    - Dislocation
  - Viscera:
    - INTRAPELVIC (EXTRAPERITONEAL) RUPTURE BLADDER & URETHRA

MYOSITIS OSSIFICANS

- **Cause:**
  - After fracture, hematoma within muscle is replaced by new bone
- **Site:**

Table 2-1 **Site of myositis ossificans**

Muscle	Bone fractured
Brachialis	Supracondylar fracture of humerus
Quadriceps femoris	Femur

- **Predisposing factors:**
  - Delayed reduction
  - Bad manipulations
- **Clinical picture:**
  - Within 6 weeks after injury:
    - Clinically, abnormal range of movement
  - 6 weeks after injury:
    - In X-Ray, new bone within muscle
- **Treatment:**
  - Prevention:
    - Early reduction
    - Less manipulation
  - If suspected:
    - Immobilization in a cast then

· Physiotherapy (early cases)
· Excision of calcified muscle (late cases)

VOLKMANN'S ISCHEMIC CONTRACTURE

- **Definition:**
  Infarction, contracture of forearm (leg) flexors due to injury of:
  · Brachial A in supracondylar fracture of humerus
  · Popliteal A in supracondylar fracture of femur
- **Pathology:**
  · Muscle ischmeia→infarction→contracture→deformity
  · Median Nerve affected
- **Clinical picture:**
  - Early: ischemia
  - Late: deformity: **Claw hand**:
    · Flexion of wrist, IPJ · Extension of MPJ
  - Median Neuritis
- **Treatment:**
  MOST IMPORTANT IS TO CHECK RADIAL PULSE
  - Prevention:
    - Reduce fractures at elbow
    - Repair brachial A if ischemic
  - Deformity:
    - Mild cases: cast or physiotherapy
    - Advanced cases: muscle sliding operation
- **Complications of treatment:**
  - External fixation by cast:
    · **Joint** stiffness · **Muscle** atrophy
    · Compartmental syndrome **if tight**
    · Imperfect reduction **if loose**
  - Internal fixation by plates & screws:
    · **In**fection · **Im**proper fixation
    · Blocking joint
    · **In**terference of union if much stripping of periosteum

TREATMENT OF FRACTURES

1. First aid treatment:

· Sterile dressing, anti-tetanus · Stop bleeding
· Immobilization · Analgesics

2. Reduction:

- Closed reduction: by traction & counter traction
- Open reduction: by exposure & opposition surgically

3. Fixation:

A. External fixation (on closed reduction):

- Types:
  · Cast: circumferential · Spica: hip or shoulder
  · Slab: from one side only
  · Jacket: trunk without limbs
  · Functional cat brace: for LL fractures, 3 segments with a hinge

B. Internal fixation (on open reduction):

- Indications:
  · Fracture: femur, with vascular injury or Multiple
  · Impossible external fixation
- Methods:
  · Synthetic materials
  · Bone grafts: from Tibia, Fibula, Iliac crest, Ribs

C. Fixation by continuous traction:

- Skin traction on thomas' splint
- Skeletal traction on Bohler's frame

D. External skeletal fixator (Elizarof fixator):

ONLY LINE of treatment for COMPOUND or COMMUNITED FRACTURES

4. Physiotherapy

INJURIES OF UPPER LIMBS

FRACTURE OF THE CLAVICLE

- **Types of trauma:**
  - Direct - Indirect: fall on outstretched hand
- **Site:** middle 1/3 because:
  · 2 curves · Change contour
  · Subcalvius · Nutrient A
- **Clinical picture:** as general +
  2. Loss of function: carrying UL
  7. Deformity

Table 2-2	Deformity in fracture clavicle
Medial end	Upwards by sternomastoid
Lateral end	Downwards by its weight Forewords by pectoralis major

- **Complications:**
  - Muscle: subcalvius - Vessel: subclavian
  - Bone: MALUNION is THE COMMONEST COMPLICATION
  - Joint: shoulder stiffness
- **Treatment:**
  - NO reduction: will NOT hold
  - Arm to neck sling + figure 8 bandage

SHOULDER JOINT DISLOCATION

- Instability of shoulder joint:
  · Big head · Shallow glenoid
  · Wide range of movement
  · Lax capsule · Lack of strong muscles

ANTERIOR DISLOCATION OF SHOULDER JOINT

- **Causes:**
  - Fall on outstretched hand (extension, ext. rotation, full abduction)

- Positions:
  - · Subcoracoid · Subglenoid · Subclavicular

- **Complications**
  - Joint: RECURRENT DISLOCATION is the COMMONEST COMPLICATION Due to fibrosis of the capsule, tear of labrum glenoidal
  - Nerve: axillary N
  - Muscle & tendon: rotator cuff injury i.e. unable to initiate abduction
- **Clinical picture:** as general +
  - 5. Swelling: head of humerus
  - 7. Deformity: external rotation & abduction
    - · Shoulder flattening: head humerus NOT in glenoid
    - · Inability to move shoulder
- **Treatment: (KOCHER's method)**
  - Under GA, disengage head
  - Humerus is adducted, flexed, internally rotated
  - Fixation: neck to arm sling
- **Recurrent dislocation:**
  - Treatment: **Putti-Platt operation:**
    - · Capsulorrhaphy & placation of subcapsularis
    - · To strengthen weak capsule
    - · Redislocation occurs

Fracture of proximal humerus

Table 2-3 **NEER's classification of proximal humerus fracture**

Group N	Fracture of humerus		Complication
Group I	<1cm, angulation <45 Fissure, green stick		
Group II	> 1cm, angulation >45	Anatomical neck	Avascular necrosis
Group III		Surgical neck	Axillary N injury
Group IV		Greater tuberosity	Painful Arc syndrome
Group V		Lesser tuberosity	
Group VI		Fracture + dislocation	

Then: one part fracture, two part fracture, three part fracture, four part fracture

- **Treatment:**

Table 2-4 **Types & treatment of fracture proximal humerus**

Type of fracture	displacement	Treatment	
One part fracture	NO displacement	Sling	
Two part fracture	One segment displaced	Open reduction & internal fixation	Screw & wire then arm to neck sling
Three part fracture	Two segments displaced		Repair of rotator cuff
Four part fracture	Three segments displaced		Prosthetic head + repair of rotator cuff
Surgical neck fracture			Closed reduction then arm to neck sling

Fracture of shaft of humerus

- **Complications:** Commonest is RADIAL N INJURY in spiral groove
- **Clinical picture:** as general +
  - 7. Deformity:

Table 2-5 **Deformity in fracture shaft of humerus**

Fracture	Distal fragment
Above insertion of deltoid	Abducted
Below insertion of deltoid	Adducted & pulled up

- **Treatment:**
  - Closed reduction
  - Fixation: U shaped slap & arm to neck sling
    - · If not possible, use intra-medullary nail

OR open reduction & then plates & screw

Supracondylar Fracture of humerus

- **Trauma:**
  - · Fall on outstretched hand, mostly in children with green stick fracture
- **Complications:**
  - Skin - Muscles: **myositis ossificans; discuss**
  - Vessels: **Volkmann's Ischemic contracture; discuss**
  - Nerves: median, ulnar, radial
  - Joint: elbow stiffness
  - Cubitus varus or valgus: leading to delayed ulnar neuritis
  - Bone: malunion
- **Clinical picture:** as general +
  - 7. Deformity

Table 2-6 **Deformity in supracondylar fracture of humerus**

	Extension type 99%	Flexion type 1%
Distal fragement	Displaced upwards & **back**wards	Displaced upwards & **for**wards

- **Treatment:** ALWAYS CHECK RADIAL PULSE
  - Reduction:
    - Urgent to decompress brachial A
    - PRICIPLE LINE OF TREATEMNT IS TO CHECK RADIAL PULSE
    - Elbow extended, reduce forwards
    - Check carrying angle
  - Fixation: posterior slab, arm to neck sling

- OR open reduction & internal fixation by plates & screw in brachial A injury

Fracture shaft radius & ulna

- **Trauma:**
  - · Direct: at same level
  - · Indirect: at different levels
- **Complications:**

  COMMENEST IS COMPOARTMENTAL SYNDROME
- **Clinical picture:** as general +

  7. Deformity:

Table 2-7 **Deformity in fracture shaft radius & ulna**

Site of fracture	Distal fragment
Above pronator teres	Fully pronated
Below pronator teres	Fully pronated
Below pronator quadrates	Uncontrolled

- **Treatment:**

Table 2-8 **Types & treatment of fracture shaft radius & ulna**

Type of fracture		Treatment
Stable	One bone	Closed reduction, external fixation
Unstable	Both bone	Open reduction, internal fixation to prevent synostosis

Colle's fracture (Old women's fracture)

- **Definition:** fracture distal inch radius, more in osteoporotic
- **Association:** ±styloid ulna ± fibrocartilage
- **Complications:**
  - Bone: MALUNION IS THE COMMENEST
    - · Sudeck's
  - Muscle: extensor pollicis longus
  - Joint: fingers & shoulders
  - Nerve: Carpal tunnel syndrome
  - Lost forearm rotation
- **Clinical picture:** as general +
  - Radial styloid NOT distal

  7. Deformity: DINNER FORK DEFORMITY
    - · Distal fragment: upwards, backwards & laterally
- **Treatment:**
  - Reduction: THREE HAND GRIP METHOD
    - Reduce distal segment

      1. Down 2. Forwards 3. Medial
  - Fixation: cast
  - After care: mobilize fingers, elevate arm to prevent stiffness
  - Physiotherapy

Fracture pelvis

- **Mechanism:** high energy trauma
- **Classification of fracture pelvis (Young & Burgers):**

  1. Lateral compression:
     - · Internal rotation of hemipelvis
     - · Pelvic volume, so bleeding is reduced
  2. Anteroposterior compression:
     - · External rotation of hemipelvis (OPEN BOOK INJURY)
     - · Pelvic volume, so bleeding is increased
  3. Vertical shear:
     - · Hemipelvis displaced upward
     - · Sciatic N injury
- **Stability of posterior arch:**

  Type A: stable

  Type B: rotationally unstable i.e. partial disruption

  Type C: rotationally & vertically unstable i.e. complete disruption
- **Double breaks in anterior segment:**
  - · Butterfly fractures
  - · Causing rupture bladder & urethra
- **Complicastions:**
  - General: discuss, but:
    - · HYPOVOLUMIC SHOCK IS THE COMMENEST
  - Local: discuss, but
    - Vessel: Int. iliac
    - Bone: shortening
    - Joint: hip
    - Nerve: sciatic N in vertical shear
    - RUPTURE BLADDER & URETHRA (INTRAPELVIC TYPE)
- **Clinical picture:**
  - NO standing, but passive movement
  - Shortening
  - Complications: shock, rupture bladder & urethra
- **Investigations:**
  - PLAIN X-RAY IS MANDATORY IN ATLS
  - CT scan: in stable patients
- **Treatment:**
  - **PRINCIPLE LINE OF TREATEMNT is CORRECTION OF SHOCK**
  - Treatment of visceral injury

  Then
  - Treatment of fracture:
    - · External fixator or C-clamp to reduce bleeding, then definitive fixation
    - · Butterfly: internal fixation

FRACTURE NECK OF FEMUR

- **Trauma:**
  - · Old osteoporotic
  - · Foot catches carpet
- **Classification:**

Table 2-9 **Classification of fracture neck of femur**

	Anatomical	Intra-articular
Supratrochanteric	· Subcapital · Transcervcial · Basal neck ·Intertrochantric	· Subcapital · Transcervical Malunion due to avascular necrosis
Infratrochanteric	Subtrochantric	

Garden's classification for intra-articular fractures		
	Grade 1	Grade 2
Fracture	Incomplete	Complete
Vessel	Preserved	Preserved
	Grade 3	Grade 4
Fracture	Complete Partially displaced	Complete Fully displaced
Vessel	Damaged	Damaged
	Avascular necrosis	

- **Clinical picture:** as general +

7. Deformity:

Table 2-10 **Deformity in fracture neck of femur**

Supratrochanteric	Abducted, externally rotated
Infratrochanteric	Adducted

- Painful movement: unable to lift limb
- Short limb

- **Complications:** as general +
  - AVASCULAR NECROSIS IS THE COMMENEST
  - THROMBOEMBOLISM IS THE 2ND COMMON
  - Bone: NON union, Mal union (coxa vera)
  - Joint: hip - Nerve: Sciatic N
  - Prolonged immobilization
- **Treatment:**

Table 2-11 **Treatment of fracture neck of femur**

Type		Garden	Treatment
Intracapsular	·Sub capital ·Transcervical	Garden 1,2	Internal fixation by parallel screws
		Garden 3,4	Hemiarthroplasty (Austin-Moore)
Extracapsula	·Basal neck ·Intertrochantric		Dynamic hip screw (DHS): allow fracture to compress
	·Subtrochanteric		Intramedullary nail

FRACTURE SHAFT OF FEMUR

- **Trauma:** car accident
- **Complications:**
  - General: discuss
    - Volkmann's Ischemic contracture: discuss
    - Myositis ossificans: discuss - Fat embolism
  - Local:
    - Bone: Mal-union→short limb
    - Vessel & nerve: popliteal in supracondylar fractures
- **Clinical picture:** as general+

7. Deformity:

Table 2-12 **Deformity in fracture shaft of femur**

Site of fracture	Distal fragment
Upper 1/3	Adducted
Middle 1/3	Angulation & overriding
Lower 1/3	Pulled backward so Volkmann

- **Treatment:**
  - 1st aid: CORRECTION OF HYPOVOLUMIC SHOCK
  - Do NOT allow shortening > 2 cm
  - Definitive:

Table 2-13 **Definitive treatment in fracture shaft of femur**

Age of patient	Treatment
Up to 4 years	Bryant's method over Gallow splint: · Skin traction on thigh and · Counter traction by elevated buttocks
4-15 years	Sliding traction: either · Skin traction on thomas' splint · Skeletal traction on Bohler's frame - Complications: **Mal-union**, stiffness, bed rest
>15 years	Open reduction + internal fixation by intramedullary nail or paltes & screws - Indications: Failed closed, Vessel injury, Double level
	- Complications: · Infection · Improper fixation · Blocked joint · Delayed union if too much stripping of periosteum
Supracondylar fractures	Paltes & screw **NOT** nail

Fracture shaft Tibia & fibula

- **Trauma:**
  - Direct: at same level
  - Indirect: at different levels
- **Types:**
  - Stable: one of the 2 bones is fractured
  - Unstable: both bones are fractured
- **COMMENEST COMPLICATIONS ARE**
  - COMPARTMENTAL SYNDROME
  - COMPOUND FRACTURES
- Others:
  - · Non & delayed union
  - · Vessel: popliteal
- **Treatment:**

Table 2-14 **Treatment of fracture shaft tibia & fibula**

Type of fracture	Treatment
Stable, under 16 years	Closed reduction, int fixation
Unstable	Open reduction, ext fixation
Compound or comminuted	External skeletal fixator
Comminuted or non union	Bone grafts

Pott's fracture dislocation of the ankle

Table 2-15 **Staging & treatment Pott's fracture dislocation of the ankle**

Stages	External rotation	Abduction	Adduction	Treatment	Vertical compression
(1)	Lateral maleolus	medial maleolus or medial ligament	Lateral maleolus or lateral ligament	Weight bearing below knee cast + physiotherapy	Fall from height→burst
(2)	Stage (1) +			Non weight bearing below knee cast + physiotherapy	Fracture anterior lip of tibia
	Medial maleolus or medial ligament	Lateral maleolus	Medial maleolus		
	With dislocation of the talus				With anterior Dislocation of talus
	Lateral	Lateral	Medial		
(3)	Stage (2) +			Open reduction + internal fixation + physiotherapy	Fracture of posterior margin of tibia & posterior dislocation of tibia
	Fracture of posterior margin of tibia & posterior dislocation of talus				

- **Complications:**

  As general +
  - Joint: ankle & Sudeck's atrophy
  - Bone: mal & non union, osteoarthrosis
- **Treatment:**
  - Aim: to restore

    · Position · Joint line · Stability

Thoraco-Lumbar spine injury

Table 2-16 **Thoraco-lumbar spine injuries**

Types	Stable		Unstable
	Wedge compression	Comminuted fracture	Fracture dislocation
Trauma	Flexion injury	Vertical compression	Flexion-rotation forces
Pathology			
Part affected	Front of vertebrae	Body of vertebrae	Lat & for displacement
Post. Lig.	Intact	Intact	Rupture
SC injury	No	±	Damage
Clinical picture	Mild pain & tenderness	More severe	Pain, tenderness & shock
Investigat-ions	· X-Ray, CT & MRI		· Myodil myelography
Treatment			

First aid	· Prevent movement · Treat shock · Examine neurologically		
Curative treatment	· Firm mattress · Exercise · NSAID	Plaster jacket followed by exercise	· Gentle reduction then plaster jacket · Open reduction + internal fixation

Acute osteomyelitis

- **Etiology:**
  - Type of patient: children
  - Organism: **STAPH**, STREPT, pseudomonas
  - Route: commonly blood, less direct
- **Pathogenesis:**
  · Mild trauma → hematoma → infection from septic focus
- **Pathology:**
  - Transversely → subperiosteal abscess → sinus
  - Intrarticular → septic arthritis
  - Vertically → through medulla → sequestrum
  - Blood → pyemic abscess
  - Involucrum: new bone - Abscess
  - Remodeling: restoring normal contour
- **Complications:**
  · Septic arthritis · Chronicity · Fractures
- **Clinical picture:**
  - General constitutional
  - Local:
    · Signs of local inflammation over metaphysis
    · Limited movement · Joint effusion · Complications
- **Investigations:**
  - Leucocytosis, +ve culture
  - X-Ray: no changes before 3 weeks
  - Radio-isotopic scanning with 99Tc-HDP: of choice, ↑ activity
  - Aspiration from abscess
- **Treatment:**
  - Rest, antibiotics - Splint
  - Evacuation of abscess + drilling
  - After care: continue splint to avoid fracture

Chronic after acute osteomyelitis

- **Pathology:**
  - Involucrum: new bone
  - Sequestrum: separated dead piece of bone
  - Cloaca: openings evacuating pus
  - Sinuses - Abscess
- **Clinical picture:**
  - History - Pain, swelling, fever
  - Thickening, tenderness, sinuses
- **Investigations**:
  - X-ray
  - CT & MRI: for extent, abscesses, sequestrum
  - Bone scan: foci of infection
- **Complications:**
  · Exacerbation · Fractures
  · Amyloidosis · Arrest of growth
- **Treatment:**
  - Sequestrestomy
  - Saucerization:
    i. Remove edges ii. Pack cavity with chips or flaps
    iii. Cast to avoid fractures

TB of spine (Pott's disease)

- **Pathology:**
  - Affects vertebrae & discs
  - May start as:

Table 2-17 **Pathology of TB of spine**

Intraosseous focus (central)	Periosteal focus
Osteomyelitis in children	Osteomyeilitis in adult
collapse→kyphosis	Cold abscess
Late & rare paraplegia	Early paraplegia

- **Complications:**
  - General: Toxemia, military, amyloidosis
  - Local:
    - Cold abscess:
      Collects under ant. Long. Lig. Then into spinal canal then trickles into
      - Cervical region:
        · Retropharyngeal
        · Post. Triangle · Post. mediastinum
      - Thoracic region:
        Abscesses:
        · Mediastinal · Psoas · Intercostals
        Empyema
      - Lumbar region:
        Abscesses:
        · Psoas · Iliac · Perinephric · Pelvic
    - Paraplegia
      - Early: due to
        · Cold abscess · Sequestrated bone · Meningitis
      - Late: due to kyphosis from intraosseus
    - Deformity: kyphosis
- **Clinical picture:**
  - Pain: dull aching
  - Localized tenderness: elicited by
    · Percussion · Tapping

- Rigidity & limitation of spinal movement:
  - · Rigidity: no concavity of spine
  - · Limitation: by coin test, flex knee NOT spine
- Complications

- **Investigations:**
  - For TB
  - X-Ray spine:
    - · Deformity · Destroyed vertebrae · Disc space lost
    - · Abscess shadow
  - CT & MRI spine: accurate
- **Treatment:**
  - Anti-TB
  - Conservative: cast for spine
  - Operative: to decompress spinal cord

Table 2-18 **Operative treatment in Pott's disease**

Aim: decompress spine

Operation	Indications
Angulation of bed	Kyphosis in children
Aspiration or costotransversectomy	Large abscess
Arthrodesis	If extensive destruction
Anterolateral decompression	Release cord compression

Benign tumors

Ivory osteoma

- **Pathology: from membranous bone**
- **Clinical picture:**

Table 2-19 **Clinical picture of ivory osteoma**

Site of tumor	Presentation
Outer skull table	Mass
Inner skull table	Compress brain
Orbit	Proptosis
Nose	Block sinuses

- **Treatment:** excision

Cancellous osteoma (osteochondroma) (Exostosis)

- **Origin:**
  - · Bony projections capped by cartilage
  - · In children & young adult
- **Pathology:**
  - Site:
    - · Metaphysic of long bone
    - · Fusion of epiphysis stops growth of swelling
  - Types:
    - Solitary
    - Multiple (diaphyseal acalsis):
      - · Multiple exostosis · Dwarfism, deformity
- **Clinical picture:**
  - · Mass · Pain (on N) · Ischemia (on A)
  - · Block joint · Fracture · Sarcomatous changes
- **Plain X-Ray:** bony swelling at metaphysis
- **Treatment:**
  - Excision at puberty
  - Excision before puberty if complicated or malignant

Malignant tumors

Table 2-20 **Malignant tumors of Bone**

	Giant cell tumor	Osteosarcoma
Origin	Spindle cells	- Osteoblasts: · Osteolytic 90% · Osteosclerotic 10%
Site	Head	Neck
Gross	Articular cartilage preserved	
	Thinning of cortex	Erodes: · Cortex → bone ghosts · Periosteum →Codman's triangle · Soft tissue → sun ray appearance
	No spread to medulla (medullary plug)	Spread to medulla
Microscopic		
Cells	Spindle, giant	Pleomorphic
Stroma	Vascular	Ostoid
Behavior	Locally malignant	Sarcoma
Complications	Pathological fractures	
	· Recurrent · Sarcomatous changes	· Blood metastasis · Cachexia
Clinical picture	· Never before 20 years · Swelling then pain · Complications	· 10-20 years · Pain then swelling · Complications
Examination	Egg-shell sensation	Warm, pulsating
X-Ray	· Soap bubble · Hypodense · Respects cartilage · Medullary plug	· Bone ghosts · Codman's triangle · Sun ray appearance · Blood metastasis
CT scan, MRI, biopsy		
Treatment	1.Curettage + graft OR 2.Excision+prosthesis OR 3.Amputation + radiotherapy	Triple attack: 1.Preoperative radiotherapy 2.Amputation 3.Postoperative chemotherapy

Chondrosarcoma

- Pathology: flat bones i.e. pelvis
- X-Ray: shadow with fluffy cotton appearance
- Treatment: amputation (chemo, radiotherapy)

Ewing's sarcoma

- **Incidence:** 2nd commonest in children
- **Pathology:**
  - Site: shaft
  - Gross picture:
    - · Erodes cortex
    - · Onion peel appearance
  - Spread: blood
- **Clinical picture:**
  - Age: children
  - Painful warm swelling simulating osteomyleitis
- **Investigations:**
  - X-Ray: onion peel appearance
  - CT scan, MRI, biopsy
- **Treatment:** radiotherapy then amputation or excision

Multiple myeloma

- **Origin:** plasma cell in red marrow
- **Complications:**
  - · Fracture & paraplegia
  - · Hypercalcemia & metastatic calcification
  - · Anemia · Infection · Amyloidosis
- **Clinical picture:**
  - Bone:
    - · Back pain, sciatica · Fracture · Hypercalcemia
  - Abnormal antibodies:
    - Complete: thrombosis→Reynauld's phenomenon
    - Incomplete: Bence Jones protein - Infection
- **Investigations:**
  - CBC - BM aspirate - Urine
  - X-Ray: multiple osteolytic lesions
- **DD of multiple osteolytic lesions in X-Ray:**
  - · Ewing's sarcoma · Multiple myeloma
  - · Metastases · Hyperparathyroidism
  - · NOT osteoporosis
- **Treatment:**
  - Radio & chemo - BM transplantation

Secondaries of bone:

- **Etiology:**
  - · Direct · Blood
- **Pathology:**
  - Site: flat bone
  - Gross picture:
    - · Osteolytic: commonest · Osteosclerotic: PROSTATE
    - · Diffuse
- **Clinical picture:**
  - · Primary · Pain, anemia · Fracture, ↑ca · Swelling
- **Investigations:**
  - · Bone scan, X-Ray · ↑ phosphates
- **Treatment:**
  - · Chemo, radiotherapy · Fixation if fractures
  - · NO excision

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Chest Surgery 3

INTRODUCTION

- **MAIN causes of death in cases of chest trauma:**
  - Circulatory failure
  - Respiratory failure
- **First aid measures in a patient with chest injury:**
  - Support circulation: by anti-shock
  - Support respiration:
    - Patent airway
    - Aspirate secretions
    - Proper oxygenation by:
      - O2 mask
      - Tracheostomy
      - Tube + ventilation

    If:
      - RR> 40/min
      - PO2 < 60 mmHg
      - PCO2 > 45 mmHg
      - Analgesics
      - Flail chest
      - ↑ ICT

Table 3-1 **Different respiratory problems & their management**

Problem	Management
Tension pneumothorax	Wide bore needle
Sucking wound	Flutter-valve dressing
Flail chest	Strapping (cotton bed + plaster)

- **Urgent investigations:**
  - Laboratory:
    - Blood gases
    - Blood sugar
    - Blood picture
    - Kidney functions & electrolyte
  - Radiological:
    - X-Ray & CT chest
    - Duplex, angiography
  - Instrumental:
    - ECG, echo, thalium scan, CVP
    - Thoracocentesis: may reveal blood, lost –ve pressure
    - Bronchoscopy, esophageoscopy
- **After 1st aid, definitive treatment:**
  - Intercostals tube + underwater seal
  - Thoracotomy

FLAIL CHEST

- **Trauma:** Loose segment of chest wall due to ant & post fracture of more than 4 ribs
- **Complications:**
  - Paradoxical respiration:
    - Flail moves inwards → ↓ tidal volume, V/Q mismatching → **TYPE 1 RESPIRATORY FAILURE**
  - Pendulum respiration:
    - Air rebreathing → oscillation of gases → ↑ PCO2 → **TYPE 2 RESPIRATORY FAILURE**
  - Mediastinal flutter:
    1. Side to side mediastinal movement
    2. Inefficient -ve pressure

    So **CIRCULATORY FAILURE**
- **Clinical picture:**
  - Pain, ↑ by breathing, tenderness, crepitus
  - Dyspnea, cyanosis, respiratory failure
  - Tachycardia & hypotension
- **MAIN causes of death:** discuss
- **First aid treatment:** discuss
- **Specific treatment:**
  - If small: bad + plaster (external)
  - If severe in old: IPPV (internal)
  - Thoracotomy
- **Urgent investigations:** discuss

PNEUMOTHORAX

- **Definition:** air in pleura
- **Etiology:**
  - Trauma: blunt or penetrating
  - Spontaneous: rupture bullae or TB cavity
  - Iatrogenic: IPPV or CVP
- **Types:**

1. Closed pneumothorax:

- Trauma
- C/P: pain, dyspnea
- Examination
- Treatment:
  - If small, conservative

· If severe dyspnea: tube + underwater seal

2. Open pneumothorax:

- Etiology: open defect > 2/3 trachea
- Complications: severe cardio-respiratory failure
  · Paradoxical respiration · Pendulum respiration
  · Mediastinal flutter

3. Tension pnemothorax

- Etiology: Valvular wound → air under tension causing:
  · Bilateral lung collapse · ↓ Venous return
- Clinical picture:
  · CV distress · Dyspnea, cyanosis
  · Congested neck veins, hypotension
  · Signs of tension pneumothorax
- Chest X-Ray:
  · Bilateral lung collapse
  · Deviated shadows · Depressed diaphragm
- Treatment:
  - Wide bore needle then
  - Intercostals tube + underwater seal
  - Continuous bubbling indicates fistula which requires surgery

HEMOTHORAX

- **Etiology:**
  - Pathological
  - Traumatic: injury to lung, mammary or major vessels, post-operative
- **Clinical picture:**
  · Pain, dyspnea, cyanosis, shock
  · Signs of pleural effusion
  · Signs of internal hge
- **Investigations:** *discuss*
- **Complications:**
  · Clotting · Defibrination
  · Empyema · Frozen chest due to organization
- **Treatment:**
  - First aid: see before
  - Definitive:
    Procedure: tube + underwater seal or thoracotomy
    Indications:
    · Severe or persistent bleeding
    · Initial tube bleeding > 2L
    · Clotted or loculated hemothorax

POST-OPERATIVE PULMONARY COMPLICATIONS

More surgical patients probably die of post-operative chest problems than anything else

- **Etiology:**
  - Preoperative causes:
    · Extremes of age · Male > female
    · Chronic bronchitis · Dehydration
  - Operative & postoperative causes:
    · Anesthesia: trauma, atropine
    · Operation: thoracic, upper abdominal
    · Abdominal distension: due to ileus
    · Postoperative pain: recumbency → DVT
- **Pathophysiology:** after upper abdominal surgery, ↑ incidence of postoperative complications due to:
  · ↓ Vital capacity · Elevated diaphragm
  · Chronic bronchitis

1. Postoperative atelectasis:

- Predisposing factors: discuss
- Pathology:
  · Bronchial obstruction by plug → collapse of affected area, may be lobular, lobar or massive
- Symptoms:
  · Sudden dyspnea, pain · Slight cough & sputum
  · Complications · Subside with exacerbation
- Signs:
  - Unexplained tachycardia & fever during 1st PO day

Table 3-2 **Unexplained tachycardia & fever**

1st day	Lung collapse
5th day	DVT
1 week	Wound infection

  - Signs of collapse
- Chest X-Ray
- Prevention: avoid predisposition
- Treatment:
  - Expel plug by:
    · Turning patient & percussing
    · Mucolytics & expectorant
  - Suction - Antibiotics, exercises, ambulation

2. Pulmonary embolism

- Etiology: **Virchow's triad; discuss**
- Pathological sequelae:
  - Mechanical effects:
    · Arrhythmias · Pulmonary infarction: in < 10 %
    · ↓ CO → shock · Dilated bronchial A
    · Myocardial hypoxia
  - Humoral reflex effects: due to histamine & serotonin
    · Pulmonary hypertension
    · Broncho-constriction → hypoxia
- Clinical types:
  - Fatal type: sudden death
  - Massive type: acute HF
  - Moderate type: pulmonary infarction
  - Recurrent showers: pulmonary hypertension

NB | Unexplained dyspnea + heart failure in hospital

| = pulmonary embolism

- Differential diagnosis: pneumonia, MI, HF

- Investigations:
  - Blood gases: PO2 < 50. PCO2 normal
  - ECG, echo - Chest X-Ray
  - Ventilation/perfusion pulmonary isotope scan:
    - Investigation of choice, areas with PE shows normal uptake
  - Pulmonary angiography: filling defect
  - CT with contrast: investigation of choice
  - Duplex: for DVT - D-Dimer
- Treatment:
  - Thrombolytic therapy: streptokinase
  - Heparin, oral anticoagulant - Embolectomy

3. Adult Respiratory Distress Syndrome

- Definition:
  - Acute respiratory failure with non cardiogenic pulmonary edema leading to hypoxemia refractory to O2 therapy:
    - Chest X-Ray: diffuse infiltrate
    - Pulmonary wedge pressure: < 16 mmHg
    - PO2/FiO2: < 20 mmHg
- Causes:
  - Pulmonary
  - Traumas
  - Septicemia
  - DIC, pancreatitis
- Pathophysiology:
  1. Inflammatory phase:
     - Activated neutrophils & macrophages → mediators → activate complement & coagulation → pulmonary edema
  2. Proliferative phase: of type II pneumocytes
     - Fibroblast
  3. Progressive interstitial fibrosis:
     - Atelectasis, ↓ residual capacity
     - Hypoxemia, respiratory failure
     - Pulmonary hypertension & RSHF
- Management: in ICU
  - Manage cause
  - Nutrition
  - Mechanical ventilation
  - Fluid
  - Nitric oxide
  - Antibiotics

Cardiac arrest (CPR)

Definition:

- Sudden cessation of effective circulation & respiration

Causes:

- 1ry cardiac arrest:
  - Hypoxia
  - Hypothermia
  - Hypo, hyperkalemia
  - Hemorrhage
  - Acidosis
  - Drugs
  - Myocardial disease
- 1ry Respiratory arrest:
  - Upper airway obstruction
  - Respiratory failure
  - CNS depression
- Simultaneous cardiac & respiratory failure:
  - Chest injuries
  - Massive lung collapse
  - Massive pulmonary embolism

Management:

1. Diagnosis:
   - Pulse: absent - Respiration: absent
   - Pupils: dilated - Intra-operative: NO bleeding
2. Emergency: external CPR by
   - Closed cardiac massage
   - Mouth to mouth breathing
   - Observe chest, palpate femoral
3. At hospital:
   - Endotracheal tube + mechanical ventilation
   - ECG is done. If
     - Ventricular fibrillation, so:
       → DC shock
       - If failed → Ca gluconate
       - Intra-cardiac adrenaline
     - Asystole, so:
       → Intra-cardiac adrenaline + Ca gluconate
       → Open massage
4. Treatment after correction of arrest:
   - Continue observation - Correct predisposition
   - Vasopressors: inotropes
   - Prevent anuria & tubular necrosis

Table 3-3 **Special conditions & their treatment**

Condition	Treatment
Acidosis	NaHCO3
Hyperkalemia	Glucose/insulin
Delayed consciousness	Hypothermia, mannitol

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4 Neurosurgery

Neurofibroma

- **Definition:**
  - · Proliferative condition of the nerves with tumors and café au lait pigmentation
- **Varieties:**

1. Solitary neurofibromatosis:
- · Swelling along axis of N.
- · Café au lait patch

2. Generalized neurofibromatosis:
- Clinical features:
  - · Preceded by café au lait
  - · Multiple tumors all over the body along axis of Ns
  - · Malignancy is indicated by anesthesia, pain, paralysis, ↑in size
- Treatment:
  - Excision for ONLY tumors:
    - · Very large · Painful · Causing pressure
  - For biopsy for malignant changes

3. Cutaneous neurofibromatosis (Molluscum fibrosum):
- · Multiple pinpoint swellings in cutaneous N. (terminals) with café au lait

4. Plexiform neurofibroma:
- Cricoids neurofibroma: Beaded swellings along Ns similar to thrombophlebitis
- Pachydermatocele: pendulous skin folds of face (5th N)

5. Elephantiasis neuromatosa:
- · Huge LL with thickened brownish skin in a child

6. Neurofibrosarcoma:
- De novo or from neurofibroma
- Characters of swelling:
  - · Anesthesia, pain, paralysis, ↑in size
- Treatment: Wide excision or amputation

Scalp injuries

- **Wounds**
  - Types of wounds: ...
  - Excessive bleeding but good healing
  - Management:
    - · Plain X-Ray · Closure in 2 layers: if defect, so flap

- **Hematoma**

Table 4-1 **Types of scalp hematomas**

Subcutaneous	Subgleal	Subperiosteal
Site according to pathology		
Small painful mobile	Large soft fluctuating extending ant,lat,post	Limited to suture line

- Treatment:
  - i. Cold then hot fomentation ii. Antibiotics
  - iii. Hematoma:
    - · Aspiration (+/- bandage) OR
    - · Evacuation if large

Fractures of the vault

- **Fissure fracture:** differentiated from

Differentiated from	By
Suture line	Anatomy, zigzag
Meningeal vessels	Anatomy

- Treatment:
  - · Conservative if no deficit
  - · Exploration if extradural hematoma

- **Depressed fractures**

Table 4-2 **Types & treatment of depressed fractures**

Types		Treatment
Compound	+lacerated scalp	i. Exploration ii. Elevate depressed bone iii. Deal with injury iv. Repair dural tear v. Antibiotics
Simple	+intact scalp	Conservative unless i. >1 inch ii. Compress motor area iii. Cosmetic iv. On air sinus

- Complications:
  - · Dural tear · Disfigurement · Dural sinus injury
  - · Infection · Epilepsy

Fracture of the base

- **Etiology: trauma**
  - · Direct: missile
  - · Indirect:

Table 4-3 **Indirect trauma causing fracture base of skull**

To	Through	To
Vault	By bursting	ALL base

Face	Maxilla	Ant cranial fossa
Chin	Mandible	Middle cranial fossa
Spine	By falling on heels	Post cranial fossa

- **Pathology of fracture:**
  - Irregular, avoid thick ridges, pass through weak points

Table 4-4 **Fracture of the base of skull**

	Ant cranial fossa	Middle cranial fossa	Post cranial fossa
Escape of intracranial content			
Blood	· Epistaxis · Raccoon sign	· Epistaxis · Escape from ear	· Occipital hematoma
CSF	· CSF rhinorrhea · pneumocephalus	· Escape from ear	
Others	· Brain matter · Meningitis	· Meningitis	· Meningitis
Cranial N injury			
	1st, 3rd, 5thoph,th, 6th So dilated pupil	5th mand,max, 7th, 8th	9th, 10th, 11th, upper cervical So retraction & stiffness
	2nd escape		12th escape
Associated brain injury			
	Contusion or hemorrhage	Contusion	Subtentorial hge
	Less severe	Severe deficit	Coma, severe bulbar compress
NBs	Raccoon sign is differentiated from subconj. Hge by (most imp):Shape, Post. Limit	Surgical emphysema around ear	

- **Treatment:** in ICU
  - i. Prevent infection: antibiotics, sterile plug
  - ii. Control CSF leak:
    - · Semi-sitting · If > 10 days, repair dural tear
  - iii. Treatment of associated brain injury

PATHOLOGY OF INTRACRANIAL INJURIES

I. Primary pathology sequelae:

1. Cerebral concussion:
   - · Slight brain distortion →temporary unconsciousness followed by complete recovery
2. Cerebral contusion and laceration:
   - · Bruising of gyri → prolonged unconsciousness and focal neurological deficits

II. Secondary pathological sequelae:

- · **E**dema→↑ICT · CSF **E**scape · **E**pilepsy
- · **I**njury of brain stem · **I**nfection
- · **H**emorrhage · **H**erniation (coning)

ACUTE EXTRADURAL HEMATOMA

- **Source:**
  - · **Middle meningeal A or V: MOST IMPORTANT**
  - · Dural sinuses
  - · Diploic veins
- **Surgical anatomy of middle meningeal A:**

Branch from maxillary A at infratemporal fossa → foramen spinosum → floor of middle cranial fossa (skull) → divides into 2 branches:

i. Anterior branch: in canal at pterion, overlies motor cortex

ii. Posterior branch: in groove at squamous part of temporal bone → along sup temporal gyrus, so he causes contralateral deafness

- **Pathology:**

Tear usually in anterior branch, blood escapes

Outwards	Scalp swelling
Upwards	Over parietal area
Downwards	Into middle cranial fossa

- **Clinical picture:**

1. Concussion: unconsciousness with trauma

Table 4-5 **Signs of concussion**

Pupils: RRR	
Muscles, sphincters: relaxed	Reflexes: lost
Vital signs: Pulse: rapid & weak RR: slow & shallow	 BP: low Temp: subnormal
Cold clammy sweat	
Post-concussion state: Post-traumatic amnesia: following Retrograde amnesia: preceding Cerebral irritation: by brain edema	

2. Lucid interval:
   - · Time for herniation to compress, between concussion & compression
   - . May be missed
3. Compression:
   - ↑ ICP - Cushing response: ↓BP, ↓RR, ↓HR
   - **Cerebral herniation**

Table 4-6 **Cerebral heriation**

Type of herniation	Compression on	Deficit
Trans-tentorial herniation	Occulomotor	Ipsilateral pupilodilatation
	Cerebral peduncles	Contralateral hemiplegia
	RAS	Coma
	Post cerebral A	Cortical blindness
Subfalcial herniation	Ant cerebral A	Cerebral infarction
Preterminal herniation	Pupil constriction then dilatation ↑HR, ↓RR, ↓BP	
Tonsilar herniation	Medullary centers	Death

- Signs of lateralization:
  - Ipsilateral:
    - · Scalp hematoma · Skull fractures

· Constriction then dilatation of pupil
- Contralateral hemiplegia
- CT, MRI urgent

▪ **Investigation:** CT with contrast
· Biconvex hematoma

▪ **Treatment:**
- Urgent exploration (at pterion) to evacuate hematoma
- Middle meninigeal A:
· At foramen spinosum: plug
· Within dura: suture
· At bony tunnel: bone wax
- Sinuses: suture or muscle graft

SUBDURAL HEMATOMA

▪ **Source:** superior cerebral A

▪ **Types:**

1. **Acute:** severe trauma→concussion , compression with no lucid interval

2. **Chronic subdural hematoma:**

• **Incidence:** old bilateral in 20%

• **Pathology:**
· Minor trauma → rupture of sup cerebral V → subdural hematoma → ↑size by CSF → compression

• **Clinical picture:**
· ↑ ICT · Focal signs
· Herniation: discuss

• **Investigations:** biconcave hematoma

• **Treatment:** Explore, incise dura, evacuate hematoma

MANAGEMENT OF HEAD INJURIES

1. First aid treatment at the scene:
· Protect Airway: by tilting head
· Stop scalp Bleeding; by careful bandage
· Neck Collar for cervical spine
· Conrol CSF by plug
· Transfer to hospital

2. Initial care at the hospital:
· Support respiration by suction, tracheostomy, intubation
· Anti-shock · Anti-tetanic
· Anti- convulsant · Antibiotics

3. Initial examination
- History: accident, consciousness
- Vital signs: Cushing triad
- Head examination: scalp, skull, eyes (pupil, lids, fundus), orifices
- Neurological examination
- General examination

• **Glasgow coma scale**

Table 4-7 **Glasgow coma scale**

Definition: scale to evaluate severity of head injuries

Eye opening		Verbal response		Motor response	
				6	Obeys commands
		5	Oriented	5	Localizes pain
4	Spontaneous	4	Confused	4	Flexion withdrawal
3	To command	3	In appropriate words	3	Flexion response
2	To pain	2	Inappropriate sounds	2	Extension response
1	None	1	None	1	None

· The higher the score, the better the prognosis
· Less than 8 indicates poor prognosis

4. Urgent investigations:
- Lab: sugar, gases, Hb, renal
- Radiological: X-Ray, CT, MRI
- Instrumental: AVOID puncture

5. Nursing care & observation at ICU:
· Posture: on side or semisitting
· Pyrexia: antipyretics
· Breathing: clear airway & O2
· Back: change position, tincture benzaini
· Bowel: Ryle's, enema · Bladder: catheter
· Diuretics: mannitol to ↓ brain edema

6. Repeated observation:
· Glasgow coma scale · Vital signs · Pupils, reflexes
· CT brain:

Table 4-8 **Causes of deterioration of the patient**

· Brain edema→↑ ICT	· Airway obstruction
· IC hematoma	· Respiratory infection (fever)
· Meningitis (fever)	· Over hydration

7. Management of closed injuries:

Table 4-9 **Management of closed injuries**

Conscious with concussion	Observation for 24 h
Comatosed with severe brain damage	ICU (mostly fracture base)
Semi-comatosed with good vital signs	Close observation. If deterioration, so surgical

8. Management of open injuries: surgical treatment

LUMBAR DISC PROLAPSE

▪ **Etiology:**
- Trauma: heavy objects
- Congenital: weakness of ligaments

▪ **Pathology:**

- Site: L4-5, L5-S1
- Stages:
  - First:
    - · Fragmentation of annulus & nucleus
    - · Prolapsed of disc
  - Second: pressure → sciatica or cauda
  - Third: fibrosis with more pressure

▪ **Clinical picture:**
- Low backache:
  - · Commonest · ↑ By effort, ↓ by rest
  - · Lost lordosis
- Sciatica
- Motor weakness, wasting
- Sensory: numbness & parasthesia
- Lasegue's sign: dorsiflexion of foot in straight leg causes severe pain

▪ **Investigations:** X-ray, CT, MRI lumbar spine

▪ **Treatment:**
- Conservative: **Main Line**
  - · Rest, analgesics, NSAID, physiotherapy, exercise
- Epidural Novocain
- Laminectomy
- Disectomy: aspiration of disc
- Fusion: if multiple level

Peripheral nerve injury

Brachial plexus injury

- Types:

Table 4-10 **Brachial plexus injury**

	Complete	Upper trunk	Lower trunk
Motor	ALL UL muscles	Abductors external rotators, flexors, supinators → waiter's tip	Intrinsic hand muscles → complete claw hand
Sensory	Whole UL except Medial arm, Deltoid	Lower deltoid	Inner arm & forearm
Horner's	Present		Present

Radial Nerve injury

- Clinical picture:

Table 4-11 **Radial nerve injury**

	Site of injury			
	At head radius	**At lower arm**	**At spiral groove**	**At axilla**
Motor		As before	As before	As before
	Finger drop	No midprone elbow flexion	Weak elbow extension	No elbow extension
	Weak wrist	Wrist drop		
		extension		
Sensory	No	1st IO space	Back of forearm &	Back of arm

Median nerve injury

- Causes
- Clinical picture:

Table 4-12 **Median nerve injury**

	Site of injury	
	At the wrist	**At higher level**
Motor	· Thenar wasting + ape hand · Pen touching test: failed · No thumb opposition	· No forearm pronation · Ulnar deviation · No index & middle flexion (pointing index) · Lost DIP thumb flexion
Sensory		Lost lat. Palmar 2/3 hand

Carpal tunnel syndrome

▪ **Surgical anatomy of carpal tunnel:**
- · Flexor retinaculum over carpal bones
- · Transmits flexors tendons & median N but NOT its cutaneous palmar branch

▪ **Causes:**
- · Rheumatoid arthritis, Colle's fracture
- · Myxedema, pregnancy

▪ **Pathology:** ischemic neuritis due to compression

▪ **Clinical picture:** middle aged female
- Pain: along distribution, ↑ at night, ↓ by hanging arm
- Late: thenar wasting & anesthesia

▪ **Examination:**
- Tenderness - ↑ pain by holding flexion

▪ **Investigation:** Nerve conduction study: delay at tunnel

▪ **Treatment:**
- Mild: analgesics, anti-inflammatory
- Severe: splitting of retinaculum

Ulnar nerve injury

▪ **Clinical picture:**

I. Injury at wrist:
- Motor:
  - Interossei:
    - · Failed cardboard test · IO wasting
    - · Ulnar claw hand deformity
  - Adductor pollicis: foramen sign; **flexion NOT adduction** on pinching paper
  - Hypothenar wasting + N little abduction
- Sensory: medial palmar 1/3 hand

II.Injury at the elbow:
- Motor: as above +

· Radial deviation · Ulnar paradox الحمد لله

- Sensory: Medial 1/3 hand (both palmar & dorsal)

5 Anesthesia

Regional anesthesia

Table 5-1 Types of regional anesthesia

Types	Description
Surface analgesia	Spray or cream for mucous membranes
Local infiltration analgesia	Injection in subcutaneous tissues
Nerve block	Injection in N sheath
Plexus block	Injection in plexus sheath
Nerve root block	Injection in epidural or subarachnoid
Local IV analgesia	For extremities

- Indications: when general is contraindicated
- Advantages: limited effect of drugs
- Relative contraindication:
  · Children, psychotics, non cooperatives
- Mechanism: dual action on cell membrane:
  · Blocking Na channels
  · Membrane expansion
- Complications:
  - Due to technique:
    · Injection intravascular · Injury
  - Due to local anesthesia:
    · CNS: stimulation then depression · CVS: ↓BP
    · Respiratory depression · Allergy

Pain control

- Effects of inadequate analgesia:
  - Respiratory:
    · ↑ Chest splitting · ↓ Tidal volume
    · Atelectasis & pneumonia
  - CVS: ↑BP & HR
- Pain control:

Table 5-2 Types, mechanisms, drugs for pain control

Pain control	Mechanism	Drugs
Transduction	Producing mediators causing impulses along sensory N	Paracetamol & NSAID
Transmission	Inhibiting A & C sensory fibers	Local anesthetics
Modulation	· Stimulating inhibitory inputs to pain (gate way theory) · Inhibiting opiod receptors	Opiods

Complications of general anesthesia:

I. Neurological complications:

1. **Cerebral hypoxia:**
   - Types:
     - Hypoxic: ↓ O2 in mixture or obstruction
     - Anemic - Stagnant - Histotoxic
   - Clinical picture:
     - Mild: delayed recovery - Severe: damage & coma
   - Treatment:
     · Ventilation · Hypothermia
     · Dehydrating for brain edema
2. **Peripheral N palsy: due to**
   · Malpositioning → brachial plexus palsy
   · Compression → lat popliteal palsy
3. **Convulsions:** in children from atropine or ether

II. Cardiovascular complications:

1. Hypertension	2. Hypotension
· Light anesthesia	· Some anesthetics
· Early hypercarbia	· Late hypercarbia
· Some muscles relaxants	· Hypovolumia
· Undiagnosed pheochromocytoma or coarctation	· Excessive PPV · Extreme ↓ or ↑ HR

3. **Cardiac dysrhythmia:**
   · Halogenated anesthetics · ↑ CO2, ↓ O2, ↓ BP
   · Manipulation in heart or gall bladder
   · Electrolyte · Thyrotoxicosis
4. **Arrest** 5. **Embolism**

III. Respiratory complications:

1. Respiratory obstruction:

Table 5-3 **Respiratory obstruction as a complication of spinal anesthesia**

Level	Cause	Treated by
Pharynx	By tongue during recovery	By inserting airway
Larynx	· By spasm · Predisposition: light anesthesia, absent tube · Precipitation: irritant anesthesia, manipulation of sensitive areas	By oxygenation
Trachea & bronchi	Secretion, vomiting	By suction & oxygenation
Alveoli	HF	
Signs	· With spontaneous breathing: noisy breathing · With controlled respiration: resistance to inflation · Cyanosis, ↑ HR, ↓ BP	

2. Respiratory depression:

- Causes:
  - · Narcotics e.g. Morphine
  - · Muscle relaxants
  - · Metabolic as uremia, DM
  - · Hypothermia
- Treatment: cuffed tube + ventilation

3. ARDS, pulmonary embolism, atelectasis

IV. Gastrointestinal complications:

Vomiting & regurgitation:

- Predisposing factors:
  - · Full stomach
  - · ↑ Intra-abdominal pressure
  - · Intra-abdominal manipulation
- Sequelae:
  - · If mild, laryngospasm
  - · If severe, hypoxia
  - · Late: infection
- Prevention:
  - · Empty stomach
  - · Cuffed tube
  - · Avoid inhalational anesthesia if vomiting is possible
  - · Use sucker during recovery
- Treatment:
  - · Lower head
  - · Cortisone & antibiotics
  - · Suction & oxygenation
  - · Bronchoscope

COMPLICATIONS OF SPINAL ANESTHESIA

I. Early complications:

1. Vaso-vagal attack

- Treatment: reassurance, Trendlenberg, morphine

2. Failure

3. Sensitivity:

- Treatment: O2 mask or tube + ventilation

4. Spinal shock:

- Due to:
  - · ↓Sympathetic → blood pooling → ↓ venous return
  - · ↓Sympathetic → ↓ CO (in high spinal)
  - · Loss of muscle tone → stagnation
- Clinically: ↓ HR, BP, irritability
- Early detection: BP every 5 min/ 1st 20 min
- Treatment:
  - · Trendlenberg
  - · O2
  - · Vasopressors
  - · Atropine
  - · Fluids

5. Total spinal anesthesia:

- Drug reaches subarachnoid space → ↓ BP, apnea
- Treatment: Tube + IPPV

6. Nausea & vomiting:

- Due to ↓ BP, O2, mesentery
- Treatment: antiemetic

7. Shooting pain in the leg

II. Late complications:

1. Post-spinal headache: commonest

Hypotensive headache	Hypertensive headache
Due to CSF leak by puncture	Due to irritation by drugs
↑ by sitting, ↓ by lying flat	↑ by lying flat, ↓ by sitting
Treatment: analgesics, saline	Treatment: analgesics

2. Meningitis:

- C/P
- Treatment: antibiotics, analgesics

3. Backache

4. Nerve paralysis:

- · Paraplegia
- · Cauda equina
- · Radiculitis
- · 6th N → diplopia

5. Acute urine retention: in 1st 24 h