PRINCIPLES OF

SPECIAL SURGERY



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- اللهم ارزقنى من هذا العمل رضا ومغفرة وعتقاً من النار ما حييت وبعد الممات
 - * اللهم اجعل هذا العمل صدقة جارية لا ينقطع بها عملى بعد موتى

اللهم آمين اللهم آمين

وائل متولى

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With my best wishes



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URINARY TRACT DISEASE



Anatomy of urinary tract

ANATOMY OF THE KIDNEY



SITE

- The kidney is retroperitoneal occupying the loins.

SIZE 12 x **6** x **3** cm

POSITION

- The **Rt.** kidney is lower than the **Lt.** by **0.5** inch because of the pressure of the liver on the Rt. side

PEDICLE

- Renal vein \rightarrow anterior
- Renal artery → middle
- **Pelvis** of the ureter \rightarrow posterior.

RELATIONS

A- Anterior relations

LEFT KIDNEY (Stomach bed)

- Suprarenal gland
- Spleen
- Stomach
- Pancreas & splenic vessels
- Splenic flexure

RIGHT KIDNEY:

- Suprarenal gland
- 2nd part of duodenum
- Rt. lobe of liver
- Hepatic flexure



B- Posterior relations

BOTH RT. & LT. KIDNEY

- 4 Muscles :

Diaphragm. Psoas major, Quadratus lumborum & Transversus abdominis

- 4 structures separating muscles from the post. of kidney :

- 1- Subcostal vessels & nerve.
- 2-11th & 12th
- 3- Ilio-hypogastric nerve
- 4- Ilio-inguinal nerve

BLOOD SUPPLY

Arterial Renal artery (from abdominal aorta) Venous Renal vein (drains into IVC).

A-fascia of Zukercandle

- The fascia transversalis reaching the kidney

splits into : - **ANTERIOR LAYER** \rightarrow attached to aorta

- **Posterior Layers** → attached to vertebral fascia

Surgical importance

- The two layers are fused above but NOT below SO Kidney is liable to ptosis.

B- Fibrous capsule

C- Perinephric fat

STABILITY OF THE KIDNEY

Normal Kidney is kept in position by

- Intra-abdominal pressure
- Peri-nephric fat & Zuckercandle Fascia
- Renal Pedicle
- Attachment by peritoneum to the surrounding organs



ANATOMY OF THE URINARY BLADDER

SITE

- The urinary bladder is occupies the anterior part of the pelvis

STRUCTURE

4 Angles

 APEX Attached to median umbilical ligament.

- NECK It gives the urethra.
- 2 POSREROSUPERIOR ANGLES



They are receiving the 2 ureters

4 Surfaces

Superior, posterior & 2 infero-lateral

PERITONEAL COVERING

Male superior surface & upper of base.

Female superior surface ONLY.

RELATIONS

A- Anterior relations

- MALE Puboprostatic ligament.
- FEMALE Pubovesical ligament.
- B- Lateral Lateral wall of the pelvis.
- **C- Superior**
 - MALE Intestine.
 - FEMALE Uterus & intestine

BLOOD SUPPLY

Arterial Vesical artery

(from internal iliac artery)

Venous Vesical vein

(drains into internal iliac vein).



CAVITY OF THE BLADDER

Trigone

 Triangular part of the base between the 2 openings of the ureter opening of the urethra

CHARACTERS

- 1. No rugae
- 2. **Pink** (rich blood supply)

Surgical importance

(if stone leads to hematuria)

3. No submucosa

Surgical importance - No bilharziasis

- No Egyptian cancer

4. It is richly supplied by nerves

Surgical importance it is more sensitive to pain.

.....

Internal urethral sphincter (smooth muscle)

External urethral sphincter

2nd bend when penis is flaccid

(skeletal muscle)

Penis

Navicular fossa

Prostate

ANATOMY OF THE PROSTATE

NATURE

- It is a fibromuscular exocrine glandular organ.

SITE

 It presents in males, below the bladder neck & is behind symphysis pubis.

WEIGHT 8 gm

STRUCTURE

It resembles an inverted cone

- BASE directed upwards.

- APEX directed downwards.

- 4 SURFACES Posterior, anterior & 2 infero-lateral.

POSITION

- It surrounds the prostatic urethra.
- It lies behind the lower border of symphysis pubis
- It lies in front of the lower part of rectum.
- It lies about **4 cm** from the anal orifice
 - & thus can be palpated by PR examination.



1st bend

4. Spongy part of urethra

External urethral orifice



Bladder

1. Preprostatic part of urethra

2. Prostatic part of urethra

Deep perineal pouch

Perineal membrane Bulbourethral gland and duct

3. Membranous part of urethra

LOBES OF THE PROSTATE

It is divided into 5 lobes

- ANTERIOR LOBE (isthmus)

- It lies in front of prostatic urethra

- RT. & LT. LATRAL LOBES

- They lie one **on each side** of the prostatic urethra , they are the usual sites for **S.E.P**

- POSTERIOR LOBE



- It lies **behind** prostatic urethra but <u>below</u> the 2 ejaculatory ducts , It is the usual site for **cancer prostate**.

- MEDIAN LOBE

- It lies behind prostatic urethra but above the 2 ejaculatory ducts ,
 - It is the usual site for S.E.P

RELATIONS

Base

- Surrounds the neck of the bladder
- Pierced by the urethra.

Apex

- Lies on the roof of the deep perineal pouch

Posterior surface

- Lies in direct contact with the lower part of the rectum

Anterior surface

 lies about 2 cm behind the pubic symphysis

Infero-lateral surfaces (one on each side)

- Rest on the levator ani.

BLOOD SUPPLY

Arterial Vesical & middle rectal arteries

(from internal iliac artery)

Venous Prostatic venous plexus

(drains into internal iliac vein).



Symptomatology of urinary tract

SYMPTOMATOLOGY

1. PAIN

	KIDNEY	URETER	BLADDER	URETHRA	
				Post.	Ant.
	Dull ache	Colicky	Dull ache	Dull ache	Burning
SITE	Renal angle	Along the ureter			
			Supra-pubic region	Perineum	Local penile
RADIATION	To renal point (upper outer quadrant of abdomen)	To inner side of the thigh & external genitalia	Tip of penis	Tip of penis	NO

2. HAEMATURIA (See later)

3. RETENTION OF URINE (See later)

4. Pyuria

It means presence of **pus** in urine. It may be microscopic or gross

5. Necroturia

It means presence of a piece of **necrotic** tissue in urine They represent necrotic tissue of cancer bladder

6. PHOSPHATURIA

The urine looks turbid due to **phosphate** crystals in urine. Adding few drops of acetic acid will lead to clearance.

7. CHYLURIA

The urine looks milky due to **chyle** in urine. Adding ether will lead to clearance .

8. PNEUMATURIA

It means presence of **air** in urine. It may be due to a colo-vesical fistula & infection with gas forming organisms.



It means that the amount passed each time is less than the capacity of normal bladder which is (**300 - 400** ml).

It may be ₹

- Frequency by **day** occurs with stone bladder.
- Frequency by night occurs with senile enlargement of prostate S.E.P.
- Frequency by day & Night occurs with cystitis

10. DIFFICULTY

It means difficulty due to some **obstruction** in the urinary pathway e.g. in patient with S.E.P , the urinary stream is weak.

11. DYSURIA

It means pain as discomfort on urination

12. URINARY INCONTINENCE

1. True incontinence

It is urine loss without warning 2^{ry} to defective urethral sphincters, e.g., Ectopia vesicae, Epispadius.

2. Stress incontinence

It is urine loss in association with physical strain, e.g., coughing & straining. It is common in multipara women with weak muscle support of the bladder neck

3. Overflow (false) incontinence

It is loss of urine due to chronic urinary retention.

4. Enuresis

It is bedwetting at night. It is physiologic condition during $1^{st} 2 - 3$ years of life.

5. Fistula

It is an abnormal communication between urinary & gynecological organs e.g. Vesico-vaginal & Uretro-vaginal fistula.

.....

Hematuria

DEFINITION

It means passage of blood in urine.

Түре

- 1- Frank hematuria = Red urine.
- 2- Microscopic hematuria = The blood is only detected chemically.
- **3- Painful or painless** e.g. Painful with cancer urinary bladder (squamous) or painless with cancer urinary bladder (transitional) & hypernephroma .

DD OFF RED URINE

It may be 2^{ry} to beet roots ingestion or drugs as Rifampicin or hemoglobinuria

- 1- Total hematuria : It presents all over the stream of urine & it indicates pathology in kidney or bladder
- 2- Terminal hematuria : It presents at the end of micturation & it indicates pathology in bladder neck, post. urethra or prostate.

3- Initial hematuria : It presents at the beginning of micturation & it Indicates pathology in ant. urethra.

CAUSES OF HEMATURIA

A- General causes

Thrombocytopenic purpura, hypertension, Vit k deficiency ... etc.

B- Local cause

1- Renal cause :

- Congenital : e.g. Polycystic kidney.
- Traumatic : e.g. Rupture kidney.
- Inflammatory : e.g. Acute glomerulonephritis.
- Stone
- Neoplastic lesions.
- Vascular e.g. Infarction of kidney .

2- Ureteric causes :

Traumatic, stone & neoplasm

3- Bladder causes :

Cystitis, stone & neoplasm.

4- Prostatic causes :

Prostitis, S.E.P & neoplasm.

5- Urethral causes:

Urethritis, stone & neoplasm.

DIAGNOSIS

A- History we have to find ₹

- $\ensuremath{\mathbbm O}$ The possible aetiology .
- ^② The source of blood.
- ③ The associated symptoms as pain, frequency. difficultyetc.

B- General examination

- ① Vital signs especially for hypertension.
- 2 Presence of pallor if severe hematuria i.e. anemia
- ③ Signs of **uremia** as **d**rowsiness, **d**ry tongue, **d**iarrhea, **d**ry skinetc.

C-Local examination

- ① Abdomen for renal swelling , tender renal angle
- 2 Ext. genitalia for blood at tip of penis .
- ③ Rectal examination for S.E.P, cancer prostate ... etc .

INVESTIGATIONS

According to suspected cause.

TREATMENT



RETENTION OF URINE

DEFINITION

Inability to pass urine inspite of a full bladder

TYPES

- 1- Acute : Painful retention of urine .
- 2- Chronic : Retention with over flow .
- 3- Acute on top of chronic : e.g. on top of S.E.P or cancer bladder.

1. Acute retention

A- Obstructive causes

- ① Urethra : Rupture, stricture & stone
- 2 Prostate : Prostitis. S.E.P & carcinoma .
- ③ **Bladder :** Stone. B.N.O & carcinoma

B- Post - operative causes

- ① Rectal & anal operations
- 2 Gynecological operations
- ③ Following urethral instrumentation e.g. urethroscopy

C- Neurological causes

- ① Spinal cord injuries.
- ② Nervous disease as tabes dorsalis.
- ③ Hysteria.

D- Gynecological causes

- ① Retro-verted gravid uterus
- ② Large cervical fibroid .
- ③ Ovarian tumors.

CLINICAL PICTURE

DD

(The patient has not passed urine for some hours & is unable to do inspite of presence of desire)

- Inspection : Supra-pubic pyriform mass .
- Palpation : Tender mass .
- Percussion : Dull above symphysis pubis .

Anuria = Resonant bladder on percussion + no desire .





MANAGEMENT

1- Conservative treatment (Tried at 1st)

- An analgesic is administrated .
- The patient is advised to get out of bed .
- Warm baths are advised & good hydration.

N.B: Advise patient to try to micturate in front of running water

Except If patient is with organic obstruction, We do Injection of parasympathomimetics as **carbacol** is given.

2- IF conservative ttt is failed

 Catheterization by Foley's or Nelton catheter.



• A percutaneous supra-pubic catheter can be inserted under local anesthesia.

Never

Send patient home but investigate him then treat the cause.

Chronic retention

DEFINITION

It is gradual distention & dilatation of the bladder with residual urine from chronic obstruction.

CAUSES

(Organic obstruction)

such as ① SEP.

- ② Cancer prostate
- ③ Urethral stricture.

CLINICAL PICTURE

The patient is **unaware** of it & there is no abdominal pain with residual urine

MANAGEMENT

The blood urea is estimated

before any attempts to relieve retention

50 IF blood urea < 100 mg % : Treated as acute retention

reated as acute retention

But IF blood urea > 100 mg % :

Treated by gradual decompression by catheterization to avoid the reactionary hyperemia & bleeding from the kidney due to sudden decrease of intra-vesicle pressure.



ANURIA

TYPES

I- Pre-renal anuria Due to hypovolemic shock ♣ Hemorrhage, burn or fluid loss.

II- Renal anuria e.g. Acute renal failure A.R.F

III- Post- renal anuria e.g. Calcular anuria





DEFINITION

It is a serious condition in which the anuria is due to **calcular** obstruction in the ureter.

AETIOLOGY

- 1- Calculi obstructing both ureter.
- 2- Calculi obstructing **one** ureter of the only functioning kidney.

CLINICAL PICTURE

[The patient is usually with long history of calcular disease]

Symptoms

- 1- Stage of onset : Sudden onset of renal colic from stone passing in ureter.
- 2- Stage of tolerance : The patient feels comparatively well due to dilatation of ureter above the obstruction.
- **3- Stage of uremia :** Due to pressure inside the renal pelvis, more than systolic BP so filtration is stopped .

Signs Signs of uremia + tender kidney with overlying guarding & rigidity + resonant bladder on percussion.

INVESTIGATIONS

- 1- Insert a urinary catheter to check that the bladder is empty.
- 2- Plain X-ray : (Not helpful) as the stone is small & the kidney is distended
- 3- Abdominal U/S : more useful.

TREATMENT

A- Cystoscope is passed & bilateral ureteral catheters are passed beyond the stone, then the urine is drained.

B- If ureteric catheterization is failed,

A percutaneous nephrostomy

Is performed, then the stone is extracted later.





INVESTIGATIONS OF THE URINARY TRACT DISEASE

A- Laboratory investigations

- 1- Urine analysis For (a) Chemicals as RBCs, pus....etc.-
 - (b) **Culture** for micro-organism.
 - (c) Cytology for malignant cells.
- 2- Blood urea Normal = 20 40 mg %
- 3-Serum creatinine Normal = 0.2 -1.5 mg %.

B- Radiological investigations

1- Plain x-ray

- ⇒ Shows (a) **Soft tissue shadow** of kidney if enlarged.
 - (b) **Obliterated psoas muscle shadow** by renal swelling.
 - (c) **Radio-opaque** stone or calcifications of urinary tract.

2- Intra-venous pyelography (I.V.P) urography I.V.U



- ⇒ **THE DYE Urographin** which is concentrated and excreted in urine
- ➡ THE MECHANISM Normally the dye appears in pelvi-calceal system after 5 min. & completely execrated in 1 -1.5 hour
- \Rightarrow **CONTRAINDICATED** with urea > 100 mg % or urinary tract infection .

3- Infusion pyelography

If blood urea >100 mg % (**Urographin**) is added to equal volume of saline & then infused very slowly over period of 100 min. I.V.

4- Ascending pyelography

Through cystoscope & bilateral ureteric catheter.

5- Cystography

Either ascending or descending.

- 6- Urethrography
- 7- U/S, CT scan & MRI.
- 8- Endoscopy to visualize & to take a biopsy
- 9- Urodynamic studies very useful in patient with obstructive uropathy
- 10- Radioisotope scanning.

Congenital anomalies of urinary tract

CONGENITAL ANOMALIES

CONGENITAL ANOMALIES OF THE KIDNEY

1- Anomalies of number

- 1- Unilateral agenesis. -
- 2- Bilateral agenesis.
- 3- Supernumerary kidney
- 2- Anomalies of volume & structure
 - **1- Multicystic kidney**



- 2- Polycystic kidney (See later)
- 3- Solitary (simple) cyst (See later)
- 3- Anomalies of ascent
 - Ectopic kidney (See later)
- 4- Anomalies of shape & fusion
 - Horse shoe kidney (See later)
- 5- Anomalies of renal vasculature
 - 1- Aberrant, accessory or multiple vessels.
 - 2- Renal artery aneurysm.
 - 3- Congenital A/V fistula (rare)

6- Anomalies of renal pelvis

1- Bifid pelvis :

- The commonest anomaly of renal pelvis
- Discovered accidentally at left side mainly.
- It is considered the seat of infection, stone formation or hydronephrosis.

2- Pelvi- ureteric junction obstruction :

- It is the common cause of hydronephrosis of children & adolescent.
- It is bilateral in 15 %
- Treatment :

By [**Androson – Hyne's**) operation This entails excision of proximal part of ureter & redundant pelvis.



Hydronephrosis



CONGENITAL ANOMALIES OF THE URETERS

1- Anomalies of number e.g. double ureter

Which is usually associated with supernumerary kidney or bifid pelvis. It may be complete or incomplete

2- Anomalies of termination e.g. Ectopic ureter Which is usually associated with double ureter.

3- Anomalies of structure

e.g. atresia, hypoplasia or megaureter.

CONGENITAL ANOMALIES OF THE BLADDER

1- Patent urachus

- It is a congenital urinary fistula developed from patent median umbilical ligament.
- Treatment : Excision of urachus

2- Bladder neck contracture Marion's diseas

CAUSES

- Congenital : Hypertrophy of muscle at bladder neck
- Acquired : Bilharzial fibrosis (B.N.O).

TREATMENT

- Excision of a triangular portion of bladder through a cystoscope but it is complicated by ²
 - ⇒ In **female :** Incontinence
 - ⇒ In **male :** Retrograde ejaculation.
- 3. Extrophy Ectopia vesica (See later)
 - CONGENITAL ANOMALIES OF THE URETHRA
- 1- Phimosis The prepuce becomes contracted over the glans "Pin hole" meatus
- 2. Paraphimosis The prepuce becomes tightly retracted beyond the base of the glans. If the retraction not relieved → gangrene of penis.

3. Epispadius (rare)

- The urethral orifice opens on **upper** surface of penis
- TYPES 1- Complete : Associated with ectopia vesicae .

2- Incomplete : Associated with normal bladder

4. Hypospadius (See later)

- The urethral orifice open on under surfaces of penis









1- Polycystic kidney

AETIOLOGY

Failure of fusion of the part developed from : The "mesonephros " i.e collecting tubules & The "metanephros" i.e convoluted tubules

1. Autosomal dominant (Adult type)

INCIDENCE

- Common than autosomal recessive type.
- 30 40 % associated with intra-cranial aneurysm
- 50 % Associated with cyst in liver & lung.

PATHOLOGY

- Site : Both kidneys are affected.
- N/E : Grape like appearance.
- Cut section : Shows multiple cysts of variable sizes containing coagulated blood, with normal compressed renal parenchyma & separated renal pelvis

CLINICAL PICTURE

- Age of presentation : 30 40 years.
- Symptoms :
 - ① **Uremia** is the commonest presentation If bilateral renal failure occur.
 - 2 Heaviness pain
 - ③ Hematuria (25 %) from ruptured cyst in renal pelvis.
- A- Sings :
 - ① Sings of **uremia**
 - 2 Palpable renal mass
 - ③ Hypertension (75 %) due to 11 Renin angiotensinogen

COMPLICATION

Infection \rightarrow Pyelonephritis (cause of death).

INVESTIGATIONS

A- Laboratory investigations Urine analysis, blood urea & serum creatinine

B- Radiological investigations

- 1- I. V. P : (Spider leg appearance) Elongated, stretched & wide calyces.
- 2- U/S & CT scan (diagnostic)



Polycystic Kidney







TREATMENT

A- Conservative except if complicated

- The patients drink excess water.
- They should have a low protein in diet.
- Hypertension should be controlled .

B- Surgical Rovsing's operation

- Puncture the superficial cysts to save the remaining renal parenchyma from compression & to relieve pain or hemorrhage.

N.B: Nephrectomy is contraindicated as the disease is bilateral

2. Autosomal recessive (Infantile type)

It may be presented by \Im

- 1- Enlarged kidneys which lead to obstructed labor.
- 2- Renal failure, renal rickets & uremia in infant .
- 3- Pulmonary hypoplasia "cause of death "

2- Solitary (simple) cyst

AETIOLOGY

It is not clear whether congenital or acquired as it may be related to renal tubular obstruction.

CLINICAL PICTURE

There are **no** pathognomonic symptoms or signs The condition may be ♣

Asymptomatic

- or ② Pain in flanks or back usually dull in character,
- or ③ Hemorrhage or infection lead to acute symptoms.

INVESTIGATIONS

The main value is to DD it from neoplastic tissue SO **U/S** & **CT scan** is diagnostic.

TREATMENT

A- Asymptomatic Just follow up

B- Symptomatic

1. Percutaneous needle aspiration of fluid

Replaced by **95 % alcohol** as sclerosant then examine the fluid for malignant cells.

2. Kirwin's operation

Deroofing the cyst + packing the cavity with perinephric fat

3. Partial nephrectomy :

If containing blood or show papillary growth for fear of malignancy



3- Ectopic kidney

DEFINITION

Abnormally situated kidney (arrested)

PATHOLOGY

- Site : Arrested in pelvis or iliac fossa
- Short ureter
- Renal artery arises from lower aorta or common iliac artery

CLINICAL PICTURE

- 1. Asymptomatic
- or 2.Tender mass in pelvis or iliac fossa
- or 3. Complications as infection & hematuria

INVESTIGATION

A Laboratory investigations Urine analysis, blood urea & serum creatinine

B- Radiological investigations

1- I. V. P : Shows short ureter



- 2. Aortography : Show the renal artery arises from the lower aorta or common Iliac artery
- 3. U/S & CT scan (diagnostic)

TREATMENT

- A. Asymptomatic No treatment
- **B. Symptomatic** Treat the complications.

N.B.: Mobile kidney

Nephroptosis

DEFINITION

Mobile kidney shows excess mobility beyond normal range.

(The kidney in normally mobile with respiration about 1 vertebra up & down)



AETIOLOGY

A. Predisposing factors

- ① Heavy kidney weight, i.e. renal mass
- $\ensuremath{\mathbb C}$ Shallow renal fossa especially with tall persons .
- ③ More common at Rt. side (due to presence of liver).

B. Precipitating factors

- ① Rapid loss of weight.
- ② Trauma to the loin.
- **③** Generalized visceroptosis.

PATHOLOGY

- Site : present in loin.
- Long kinked ureter
- Renal artery arises from normal level at aorta

CLINICAL PICTURE

- 1- Asymptomatic
- or 2- Kinking of renal pedicle : Recurrent renal colics & tender mobile mass in loin or Iliac fossa.
- or 3- Complications as hydronephrosis, infection & hematuria.

INVESTIGATIONS

A Laboratory investigations

Urine analysis, blood urea & serum creatinine

B- Radiological investigations

1- I. V. P:

Shows long kinked ureter





- 2. Aortography : Show the renal artery arises from normal level at aorta
- 3. U/S & CT scan (diagnostic)

TREATMENT

- A. Asymptomatic No treatment
- B. Symptomatic .

Nephropexy

(By suturing the post, renal capsule to quadratus lamborum muscle)

4- Horse shoe kidney

DEFINITION

The most medial lower poles of both kidneys fuse & so the kidneys fail to ascend completely i.e. Anomaly of ascent & rotation

N.B.: The adrenal glands are being developed in their normal place.

CHARACTERS (PATHOLOGY)

- It occurs early in embryonic life when the kidneys lie low in the pelvis
- ② Ascent of the horse shoe kidney is arrested by the isthmus being blocked against the inferior mesenteric artery (L₄)
- ③ Normal rotation cannot occur
- ④ The lower poles lie near to mild line
- ⑤ Ureters are kinked by the isthmus (Flower vase)
- ⁽⁶⁾ The blood supply is usually abnormal (from iliac artery)

CLINICAL PICTURE

- Age of patient : Any age
- **Symptoms : 1/3** of patient may be **asymptomatic** & **2/3** of them are represented by stone, hydronephrosis, infection & hematuria.
- Signs : Tender fixed mass below umbilicus

INVESTIGATIONS

A Laboratory investigations Urine analysis, blood urea & serum creatinine

- **B-** Radiological investigations
 - 1. I.V.P :

Shows the lower poles point medially

2. U/S & CT scan (diagnostic)

TREATMENT

A. Asymptomatic Just follow up

B. Symptomatic .

Isthmusectomy (rarely done) & treatment of symptoms









5- Ectopia vesica

Extrophy

DEFINITION

It is a ventral defect in uro-genital sinus leads to **deficiency** of ant. wall of urinary bladder.

INCIDENCE

1:50.000 live births (Male > female)

CLINICAL PICTURE

- **Absent** ant. wall of the bladder & ant. abdominal wall from umbilicus downwards.
- Widening of symphysis pubis → Waddling gait
- It is associated with indirect inguinal hernias.

and \Rightarrow In **male :** Epispadius is associated.

⇒ In female : Cleft clitoris.

COMPLICATIONS

- ① Recurrent urinary tract infection
- ② Development of cancer bladder
- ③ Excoriation of the skin

INVESTIGATIONS

A Laboratory investigations Urine analysis, blood urea & serum creatinine

B- Radiological investigations

Plain x-ray : Shows widening of symphysis

TREATMENT

1. Complete reconstruction : Now advisable .

- Extrophy can now be diagnosed in –utero by characteristic U/S .
- At birth : The bladder mucosa should be covered by non adherent film then convert extrophy to epispadius .
- At 2nd year : Penile & urethral reconstruction

2. Urinary diversion :

- Excision of the bladder followed with urinary diversion (uretero-sigmoid) ——— but complicated with adeno-carcinoma of sigmoid









6- Hypospadius

DEFINITION

- The external meats is situated at some point on **undersurface** of penis as in the perineum
- The missing part of the urethra is replaced by a fibrous band called **chordae**

INCIDENCE

1:300 male children

According to site of external meatus Pb

- 1- Glandular : At glans penis
- 2- Coronal: At junction of glans penis & its body.
- **3- Penile** : At undersurface of body.
- 4- Peno-scrotal : At junction on penis & perineum.
- 5- Perineal : The scrotum is split & the urethra opens between them

CLINICAL PICTURE

- 1- Meatus is ventrally placed & stenosed
- 2- Prepuce is deficient ventrally
- 3- Shaft is curved ventrally because of chordae

COMPLICATIONS

- 1- Abnormal Stream of urination.
- 2- Psychological problems.
- **3- Sterility** (**mechanical**) due to failure of installation of semen in the vagina i.e. curved penis interferes with erection.

TREATMENT

- **Hypospadius** should not be circumcised because the skin of prepuce may be useful for further reconstruction.
- Hypospadius should be repaired before school age because of the psychological reason.
- More recently pediatric surgeons have begun repair at one year
 - •1st step : Straightening the penis by removal of chordae .
 - 2nd step : Skin of prepuce is used to develop a new urethra

Now one stage surgery can be done in most of cases







Injuries of urinary tract

INJURIES OF URINARY TRACT

I- RENAL INJURIES

PREDISPOSING FACTORS

- A- Renal enlargement which makes it more liable to trauma.
- B- Diseases of the kidney e.g. Hydronephrosis.

EXCITING CAUSE "Trauma" which may be 🏞

A- Closed trauma

- ① Direct trauma :
 - Blunt trauma e.g. car accident.
- ② Indirect trauma : Fracture ribs.
- ③ Spontaneous rupture : Rare with hydronephrosis.

B- Opened trauma

- ① Gunshot wounds.
- 2 Punctured due to stabbing.
- ③ Operative trauma

PATHOLOGY

The kidney is containing a large amount of fluid e.g. urine blood, which transmits the force of trauma equally throughout tissues & surface of kidney.

Types of renal injury may be P

- 1- Subcapsular hematoma.
- 2- Superficial tear or tears.
- 3- Deep tear or tears.
- 4- Avulsion of a pole of the kidney.
- 5- Injury of vascular pedicle

COMPLICATIONS

- ① Hemorrhage which may be internal or external.
- 2 Renal cyst may follow a peri-nephric hematoma.
- ③ Associated other abdominal or thoracic injuries.
- ④ **Hydronephrosis :** Fibrosis of peri-renal tissues \rightarrow ureteric obstruction.
- S Pseudo-hydronephrosis : due to accumulation of urine in peri-nephric space
- 6 Atrophy & fibrosis
- ⑦ A/V fistula : may occur after penetrating injuries.
- **® Nephroptosis :** due to tearing of supporting tissues.





CLINICAL PICTURE

A- History of trauma

To **loin** followed by an abdominal pain ± shock.

B- Symptoms

- 1- Pain : localized to renal area
- 2- Hematuria : Microscopic or gross appearance.

N.B: Hematuria will be absent in [¬]→

- ① The injury is only **subcapsular**.
- ② The ureter is **blocked** by clot
- ③ The ureter is **injured**.
- ④ The whole kidney is **avulsed**.
- © severe hypotension from internal hemorrhage.
- 3- Paralytic ileus due to irritation from retro- peritoneal bleeding.
- 4- Retention of urine due to blood clots in urinary bladder.

C- Signs

1- SIGNS OF SHOCK

i.e. Hypovolemic shock

- ① Tachycardia & tachypnea (air hunger)
- ² Hypotension & hypothermia.
- ③ Pale cold skin & oliguria.
- 2- TENDERNESS & RIGIDITY on the affected side
- 3- MASS in flanks caused by extravasated blood & urine.
- 4- ABDOMINAL DISTENSION due to associated ileus.

INVESTIGATIONS

1- Laboratory investigations

Urine analysis, blood urea & serum creatinine

2- Radiological investigations

- 1. U/S & CT scan (diagnostic)
- 2. I.V.P shows ₹
 - Normal function & configuration if minimal injury
 - ② No visualization if total pedicle avulsion
 - ③ Deformed renal pelvis & calyces.
 - ④ Displaced renal pelvis, calyces & ureters .
 - ⑤ Extravasation of dye in peri-nephric space.
 - 6 **Confirm the presence of opposite** functioning kidney.

3. Renal isotopic scanning

useful in patients allergic to the contrast material.



4. Plain x-ray : shows ₹

- ① Obliteration of psoas muscle shadow.
- ② Obliteration of renal outlines.
- ③ Fracture one or more of lower ribs.
- ④ ± Evidence of cause e.g. bullet.
- © Distended intestinal loops from associated Ileus.

TREATMENT

A- Anti-shock measures

- Remember **ABCDE**
- Blood transfusion, warmth, morphiaetc.
- Antibiotics to prevent pen-nephric abscess formation .
- Analgesics for pain

Then

- Bed rest until hematuria has stopped.
- Large amount of fluid intake to guard against clot retention.
- Follow up charts for 3
 - ① Pulse, ABP & size of peri-renal mass .
 - 2 Urine analysis for RBCs & pus.
 - 3 HB %, haematocrite. U/S & I.V.P

B- Surgical treatment

INDICATIONS

- 1- Persistent hematuria under conservative treatment
- 2- Progressively enlarged pen-nephric mass.
- 3- Peri-renal infection.
- 4- Failure to control shock .
- 5- Open injuries
- 6- Associated intra-peritoneal injuries .

Approach Trans-peritoneal approach.

PRINCIPLES

- 1st control vascular pedicle by vascular clamp to bleeding.
- Then according [™]
 - 1- Traumatic renal tissue → Debridement
 - 2- Hematoma → Evacuation
 - 3- **Small tears** → Suture.
 - 4- Large defect → Filled with per-nephric fat.
 - 5- Avulsed **one** pole → Partial nephrectomy
 - 6- Avulsed **kidney** → Total nephrectomy provided that other kidney is functioning
II - TRAUMATIC RUPTURE OF URETER

EXCITING CAUSE "latrogenic" which may be 🎨

- ① Surgical injury during difficult gynecological operations
- 2 Abdomino-perineal resection of colon.
- ③ Endoscopic urological procedures e.g. urteroscopy

PATHOLOGY

- 1- Extravasation of urine which may be P>
 - 1- Intraperitoneal : Leading to peritonitis or urinary fistula.
 - 2- Extraperitoneal : A retroperitoneal collection can cause paralytic ileus.

2- Ureteric obstruction

- 1- Complete obstruction : causes compression of urine production from the corresponding kidney.
- 2- Partial obstruction : cause hydronephrosis.

3- Anuria & acute renal failure from bilateral injuries or those affecting

the only functioning kidney.

CLINICAL PICTURE

- A- History of trauma or history of surgery.
- **B- Symptoms**
 - 1- Pain : localized to loin area
 - 2- Nausea, vomiting & probably fever
 - 3- Urinary leakage or fistula

C- Signs

2- TENDERNESS & RIGIDITY on the affected side

COMPLICATIONS

^① Hemorrhage which may be internal or external.

② Urinary fistula

INVESTIGATIONS

1- Laboratory investigations Urine analysis, blood urea & serum creatinin

2- Radiological investigations

- 1. U/S & CT scan (diagnostic)
- 2. I.V.P

TREATMENT

Surgical treatment

Exploration of the ureter & **repair** of injury by end-to-end anastomosis or by reimplantation into the bladder.





III - TRAUMATIC RUPTURE OF URINARY BLADDER

	INTRA PERITONEAL	EXTRA PERITONEAL	
	(20%)	<mark>(80%)</mark>	
CAUSES	BLOW to lower abdomen with fully distended bladder	FRACTURE PELVIS 2ry to run over accident	
	 causes of both types Gunshot wound Stab wound Instrumentation 		
PATHOLOGY CLINICAL PICTURE	 The urine escapes into the peritoneal cavity & may lead to peritonitis 	 The urine extravasates in pelvis then it ascends up between peritoneum & the fascia transversalis. 	
Symptoms	- Supra-pubic pain	- Supra-pubic pain	
	- No desire of micturation.	 Desire of micturation. but no passage of urine 	
Signs	- Symptoms of peritonitis	- Symptoms of # pelvis	
	- Supra-pubic tenderness & rigidity.	 Supra-pubic tenderness & rigidity. 	
	- Bladder cannot be felt.	- Bladder can be felt.	
INVESTIGATIONS	- Signs of peritonitis - Signs of # pelvis		
1- X-ray	- Free Escaping contrast bladder	- Fracture pelvis	
2- Cystography	- Leak of dye from bladder	dye from bladder - Leak of dye from bladder	
TREATMENT	Anti-shock measures + Urgent exploration		
	 Abdomen is opened & urine in peritoneum is sucked. 	- Supra-pubic extra- peritoneal exploration	
	- Tear in the bladder is closed.	- Tear in bladder is closed.	
	 The bladder is drained by cystostomy tube. 	 The bladder is drained by cystostomy tube. 	
	- peritoneum is drained	 # pelvis is treated 	

IV- TRAUMATIC RUPTURE OF URETHERA

	EXTRA-PELVIC	INTRA-PELVIS	
	ANT. URETHRA	POST. URETHRA	
	Scarpa's Fascia Colle's Fascia		
CAUSES	DIRECT TRUAMA to the perineum (kick or falling astride an object) or instrumentation	FRACTURE PELVIS which tears the pubo-prostatic ligament & prostate displaced upward	
PATHOLOGY Site	- Bulbous (penile) urethra i.e. Ant. urethra.	- Membranous urethra i.e. Post, urethra.	
Extravasation of urine	- The urine escapes into the scrotum, penis & then rises up to abdominal wall under superficial fascia in front of muscles.	 The urine escapes into the pelvis then it ascends up between peritoneum & the fascia transversalis. 	
CLINICAL PICTURE	 The common presentations are ① Urethral bleeding. ② Inability to pass urine ③ Bladder is distended ④ Pain in the perineum. 		
INVESTIGATIONS	S Perineal hematoma	S Picture of # pelvis	
1- X-ray	- Free	- Fracture pelvis	
2- P/R	ve	 Prostate cannot be felt as it is displaced upwards. 	

TREATMENT

The patient is instructed NOT to void urine

- Catheter is contraindicated as it can compound the damage &. introduce infection.
- Urgent ascending urethrogram is done to obtain correct diagnosis
- Urgent supra-pubic cystostomy tube is done.
- Treatment of **# pelvis** with intra-pelvic type only.

• After 3 weeks :

Micturation cystography is done

If urethra is healed the supra-pubic tube is removed. But if stricture develops endoscopic regular dilatation or reconstruction after excision of stricture.



INDICATIONS

- 1. Urine retention.
- 2. Urine output monitoring for a critical patient.
- 3. Irrigation of blood clots e.g., after prostatectomy.
- 4. To allow healing after open urinary bladder surgery
- 5. **Intra-vesical chemotherapy** for superficial bladder cancer.
- 6. As a stent after urethral surgery.
- 7. For cysto-urethrography.



CONTRAINDICATIONS

Suspected urethral injury. Suspicion is raised by either:

- 1. Blood at urethral meatus.
- 2. Perineal ecchymosis.

COMPLICATIONS

- 1. Urethral injury particularly in cases with prostate enlargement.
- 2. Diuresis after the relief of acute retention may produce hypovolaemia.
- 3. Urinary tract infection.

Inflammations of urinary tract

INFLAMMATIONS OF URINARY TRACT

I. Pyonephrosis

DEFINITION

Chronic retention of infected urine in the kidney

AETIOLOGY

- 1^{ry} Pyonephrosis : Due to coincident infection and obstruction such as stone, stricture.
- 2^{ry} Pyonephrosis : Due to infection of pre-existing hydronephrosis.

PATHOLOGY

- The renal parenchyma : is formed multi-locular cavities with pus and lined by necrotic tissues
- There are marked peri-nephritis with chronic adhesion

According to aetiology [№]

- I^{RY} PYONEPHROSIS : (Thick wall cavities) The kidney is not markedly enlarged from associated infection and fibrosis with obstruction
- $\Rightarrow 2^{RY}$ PYONEPHROSIS : (Thin wall cavities) The kidney is markedly enlarged.

CLINICAL PICTURE

The cardinal symptoms (Pain, swelling, fever & pyuria)

- **1- Pain** in the loin & aching in character.
- **2- Swelling** which is small if **I**^{ry} type or large if **2**^{ry} type.
- 3- Fever ranging from law fever 38 °C up to high fever.
- 4- Pyuria may absent with pelvi-ureteric junction obstruction.

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for **pus** cells.
- $\ensuremath{@}$ Blood urea & serum creatinine .
- ③ Blood picture for leucocytosis .

2. Radiological investigations

- 1- U/S & CT scan (diagnostic)
- 2- Plain x-ray may show associated calculus .







3- I.V.P shows delayed or absent excretion of dye by diseased kidney.

N.B Ascending pyelography is required in many cases to :

- ① Confirm the diagnosis.
- ^② Estimate the degree of dilatation of renal pelvis
- ③ Estimate the level of obstruction.

3. Instrumental (cystoscopy)

It shows chronic cystitis or pus from ureteric orifice

TREATMENT

Infection of an obstructed kidney should be treated as an emergency

1- ANTIBIOTICS are prescribed and the kidney is drained by inserting a **PERCUTANEOUS NEPHROSTOMY TUBE** then any cause of obstruction as stone or stricture should be controlled.

- 2- NEPHRECTOMY : if advanced cases, provided other kidney is functioning.
- 3- PERMANENT NEPHROSTOMY : if the opposite kidney is non functioning

II- Perinephric abscess

DEFINITION

It is a localized suppurative inflammation of peri-nephric space

AETIOLOGY

• 1^{ry} perinephric abscess (rare) blood-borne

i.e. from distant septic focus e.g. Renal carbuncle.

• 2^{ry} perinephric abscess (common) direct spread from kidney or surrounding structure e.g. peri-renal hematoma

CLINICAL PICTURE

Symptoms

- General : Hectic Fever, Headache, Malaise & Anorexia
- Local : Acute onset of throbbing pain in loin

Signs Tender renal angle.

INVESTIGATIONS

1. Laboratory investigations Same as pyonephrosis.

2. Radiological investigations

- 1- U/S & CT scan (diagnostic).
- 2- Plain x-ray shows obliteration of psoas muscle shadow & elevated (fixed) diaphragm

TREATMENT

Urgent drainage (U/S guided) **under cover of antibiotics**.

III. Pyelonephritis

1- Acute pyelonephritis

AETIOLOGY

A- Routes of infection

- ① Ascending infection from lower urinary tract.
- 2 Hematogenous (uncommon) e.g. in infective endocarditis
- ③ Lymphatic route

B- Predisposing factors

- ① Stagnation of urine due to obstruction at any level of urinary tract.
- **② Vesico-ureteric reflux.**
- ③ Introduction of infection through catheterization

CLINICAL PICTURE

Symptoms

- General : Fever, Headache, Malaise & Anorexia
- Local : Acute onset of pain in loin with **1†** frequency & dysuria.

Signs Tender renal angle.

INVESTIGATIONS

1. Laboratory investigations Same as pyonephrosis.

2. Radiological investigations

Investigations to detect the cause.

TREATMENT

- 1- Rest, antibiotics according to culture & sensitivity test.
- 2- Excessive intake of fluid & change the P.H of urine
- **3- Correction of predisposing factors.**

2- Chronic pyelonephritis

It is due to improper treatment of acute pyelonephritis

PATHOLOGY

Early damage of renal tubules then late damage of glomeruli

CLINICAL PICTURE as acute pyelonephritis but \Im

- Recurrent attacks of loin pain,
- Hypertension, hematuria & anemia.

INVESTIGATIONS as acute pyelonephritis

TREATMENT

- Proper, regular course of **antibiotics**
- Renal transplantation if renal failure occurs.

IV. Renal tuberculosis

INCIDENCE

- Always 2^{ry} T.B.
- Age : Rare in children & usually in young age.
- Sex : Male > female

AETIOLOGY

- Causative organisms are
 - Human type 75 %
 - Bovine type 25 %

PATHOLOGY

The disease is usually **unilateral** in early stages but later on may attack the **opposite** kidney.

- The kidneys : Shows ₹

① T.B follicles affect renal pyramids then unite together to burst into the pelvi-calyceal system

\rightarrow Ulcero-cavernous type _

or unite & caseate to renal parenchyma

ightarrow Caseo-cavernous type .

② **Obstruction** of pelvis & ureter → Hydronephrosis

③ **T.B** affection of perinephric fat \rightarrow Perinephric T.B

N.B: Sometimes the kidney is shut off & atrophied So autonephrectomy is developed

- The ureters :

- Thickened, fibrosed & shortened.
- In long standing cases :

gaping & retraction of ureteric orifice occur (Golf hole ureter)

- The urinary bladder :

- Thickened, fibrosed & contracted. So. the capacity is progressively diminished (**Thimble bladder**)

- The genital organs :

- Seminal vesicles, prostate, epididymis & vas may be affected

CLINICAL PICTURE

Symptoms

- General : Night fever, night sweat, loss of weight & loss of appetite.
- LOCAL : ① Frequency is the earliest & main symptoms.

due to ① irritation by T.B debris .

② contracted bladder.

- ③ T.B cystitis.
- ② **Pain** : Dull aching in Loin.
- ③ **Pyuria** : Pus cells without organism (sterile pyuria) + hematuria.

Signs It is **unusual** for T.B kidney to be palpable & **P/R** for genital lesions.





INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for **pus** cells.
- 2 Blood urea & serum creatinine .
- **③ Tuberculin Test**

④ Bacteriological studies

- as A. Ziehl-Nelson's stain 72 % of cases.
 - B. Culture on Lowenstein media 98 % of cases
 - C. Guinea pig inoculation 94 % of cases.

2. Radiological investigations

1- Plain x-ray : show calcification in the kidney or 2ry to stone.

2- I.V.P : shows (Moth-eaten appearance)

if the calyx is affected & loses its clear outlines.

3- U/S & CT scan (diagnostic).

3. Instrumental (cystoscopy)

It shows ureteric & bladder pathology.

TREATMENT

A. Medical Anti-T.B drugs for **1** year.

B. Surgical If complicated ₹

1- Renal cavernotomy :

for single close pyocalyx by removing the roof of abscess & casseous material is removed till the healthy granulation tissue is reached.

2- Ileo-cystoplasty :

for augmentation of contracted bladder by loop of ileum

3- Nephro-ureterectomy

provided that opposite kidney is healthy.

V. Bilharziasis of the urinary bladder

INCIDENCE

- Age : 10-30 years
- Sex : Male > female
- Mainly due to Schistosoma hematobium

AETIOLOGY

The worms migrate from liver to inferior mesenteric vein & reach the bladder through the anastomosis between superior rectal vein & the vesico- prostatic plexus of veins.



PATHOLOGY

A- Site Submucosa of urinary bladder.

B- Gross picture

 Redness of mucosa i .e Patchy hyperemia It is due to extrusion of ova through the mucosa. so leads to terminal hematuria.

2- Bilharzial granuloma of sub mucosa :

It is due to retained ova in wall of the bladder.

3- Bilharzial nodules (polyps) :

It is due to localized hyperplasic epithelium.

4- Bilharzial papilloma :

It is a polypoid projection of mucous membrane

5- Bilharzial ulcer :

It is due to atrophy of the mucosa overlying bilharzial ova.

6- Bilharzial sandy patches :

It means aggregation of **calcified dead ova** in the submucosa. It can be seen because of **atrophic over-lying mucosa.**

C- Microscopic picture

- 1- Hyperplasia of the mucosa.
- 2- Brunn's nests : It is buds of hyperplastic epithelium
- **3- Cystitis cystica** results from degeneration of Brunn's nests.
- 4- Cystitis glandularis : The Brunn's nest undergo metaplasia into columnar epithelium.

5- Squamous metaplasia which is precancerous

COMPLICATIONS

- Stricture lower 1/3 ureter
- Bladder neck obstruction (B.N.O)
- 2^{ry} bacterial infection
- 2^{ry} changes of the kidney e.g. hydronephrosis
- Stone formation
- Cancer bladder (Squamous cell carcinoma)
- Contracted bladder
- Pericystitis leading to formation of a dense fibrous sheath











CLINICAL PICTURE

1- TERMINAL HEMATURIA

It is caused by extrusion of the ova at end of micturation.

2-DIFFICULTY IN MICTURATION

At **1**st slight but in late cases severe difficulty because of B.N.O & stone formation .

3. FREQUENCY

From congestion of trigon or 2^{ry} to cystitis.

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for **pus** cells, **RBC** s & **ova**
- 2 Blood urea & serum creatinine .

2. Radiological investigations

PLAIN X-RAY

for bilharzial calcifications.-

3. Instrumental (cystoscopy)

To diagnose the extent of the disease & to take a biopsy.

TREATMENT

A . Medical treatment Anti- bilharzial drugs + urinary antiseptics.

B. Surgical treatment

According to \mathfrak{P}

- 1- BILHARZIAL POLYPS : Cystoscopic removal
- **2- BILHARZIAL PAPILLOMA : Partial cystectomy.**
- **3- BILHARZIAL ULCER : Surgical excision.**
- 4- BILHARZIAL SANDY PATCHES : Cystoscopic diathermy coagulation

C. Treatment of complications

According to 3

- 1- B.N.O: Wedge excision to relieve urine outflow obstruction .
- 2- CONTRACTED BLADDER : Ileo- cystoplasty.

3- STRICTURE LOWER 1/3 URETER :

- ① Urteroscopic balloon dilatation
- or ② Uretro-vesical re-implantation after excision of stenosed segment.
- 4- CALCIFICATION : Cystoscopic curettage & litholopaxy
- 5- CANCER BLADDER : (See later)



Urinary calculi

URINARY CALCULI

INTRODUCTION

INCIDENCE

- It is a common disorder affecting 10 - 20 % of population
- Age : mainly middle age persons but no age is excluded.
- Sex : Male > female

AETIOLOGY

1- Geography There is 11 incidence in desert

2- Climate & seasonal factors There is a relationship between higher environment temperature & 11 incidence of urinary stone

- **3- Water intake** Both **volume** & **content** of water ingested are important in the aetiology of stone disease .
- 4- Diet Some food stuffs are rich in certain crystals
 - e.g. 1- Spinach, tomatoes & mango rich in oxalates
 - 2- Liver, kidney, sardines, salmon & duck rich in uric acid
 - 3- Milk & its products are rich in calcium .

5- Metabolic & endocrine factors

These vary according to type of stone P>

(A) Ca. oxalate & Ca. phosphate calculi :

1- HYPERCALCEMIA & HYPERCALCIURIA :

due to 1 hyperparathyroidism.

② Renal tubular acidosis.

2- HYPEROXALURIA :

may be **O** Congenital : It is a rare congenital illness.

- ② Acquired : It is seen with enteric diseases.
- ③ Idiopathic : It is due to eating food rich in

oxalates in large amounts.

Kidney

Ureteral

stone

Bladder

stone

(B) Uric acid calculi :

- 1- Hyperuricemia e.g. gout.
- 2- Hyperuricosuria.

(C) Cystine calculi :

Due to hereditary cystinuria

(D) Xanthine calculi :

Due to hereditary xanthinuria.

6- Congenital anomalies

Predispose to stasis → infection & stone formation

7- Urinary tract obstruction

Predispose to stasis \rightarrow infection & stone formation

8- Infection

Infection provides a **nucleus** for future stone formation i.e pus cells & infection changes the **PH** of urine.

N.B.: Phosphates are precipitated in **alkaline** urine but oxalates, uric acid & cystine are precipitated in **acidic** urine

PATHOLOGY (Types of urinary stones)

	Oxalate	Рноѕрнате	URIC ACID
INCIDENCE	75 %	15 %	7 – 9 %
P.H	Acidic	Alkaline	Acidic
CHEMISTRY	Ca oxalate	Ca phosphate alone or with ammonium phosphate & magnesium phosphate i.e triple phosphate	Uric acid
NUMBER	Single	Single or multiple	Multiple
Size	Moderate	Large It may fill the renal pelvis & the calyces taking their shape i.e Staghorn stone	Small
SURFACE	Irregular & spiky	Smooth	Smooth
COLOUR	Although white it is usually brown to black due to incorporation of blood pigments	Yellowish white	Golden yellow
CONSISTENCY	Very hard	Chalky & friable	Hard
X-RAY	Radio-opaque	Radio-opaque	Pure uric acid stones are radiolucent



CLINICAL PICTURE

SILENT with renal & bladder stones. i.e. accidentally discovered.

PAIN caused by movement of stones. i.e. describe as (As before)

COMPLICATIONS

- ① Obstruction.
- Back pressure changes
 e.g. hydroureter & hydronephrosis.
- 3 Calcular anuria
- ④ Hematuria.
- ⑤ Migration
- 6 Infection.
- ⑦ Malignancy (renal pelvis & bladder) from chronic irritation..

INVESTIGATIONS

1. Laboratory investigations

- ① Urine analysis for **pus** cells, **RBC** s & crystals
- 2 Blood urea & serum creatinine .

2. Radiological investigations

1-PLAIN X-RAY

urinary stones are radio-opaque



2- I.V.P & ascending pyelography

Show obstruction by stone, give idea about opposite kidney. & Radiolucent stones which appear as filling defects e.g. pure uric acid stones .

3- U/S & CT scan (diagnostic).

To visualize The kidney & the degree of obstruction.



I - RENAL STONES

AETIOLOGY As before

PATHOLOGY

- Types of stones : As before.
- Site & shape :
 - Pelvis : Triangular .
 - $\ensuremath{@}$ Calyces : Rounded or oval .
 - ③ Pelvi-calyceal : Staghorn .

CLINICAL PICTURE As before.

INVESTIGATIONS As before but P

- Radio-opaque shadow may be mistaken for : 1- Rt. side with stone of gall bladder
- N.B: In case of single stone Lat. view must be done to differentiate :
 - The gall stone which present in front of spine
 - Rt. renal stone which present upon spine
 - 2- Calcified renal T.B focus.
 - 3- Calcified L.Ns in porta hepatis.
 - 4- Calcified costal cartilage .
 - 5- Calcified supra-renal gland .

URETERIC STONES

AETIOLOGY As before

PATHOLOGY

- Types of stones : As before.
- Site : It is the site of normal narrowing ① Pelvi-ureteric junction
 - ② Crossing of the iliac artery
 - ③ Intramural part " bladder wall "
 - ④ At ureteric orifice

CLINICAL PICTURE As before.

INVESTIGATIONS As before but P>

- Plain X-ray shows shadow along the course of the ureter which is \Im
 - 1- Transverse process of lumbar vertebra.
 - 2- Near sacro-iliac joints.
 - 3- Vertically to the level of ischial spine.
 - 4- Turns medially towards the bladder .







Calyceal



URINARY BLADDER STONES

AETIOLOGY As before

PATHOLOGY

• Types of stones : As before.

CLINICAL PICTURE As before +

1- Frequency :

More by day from trigonal irritation by the stone, later on day & night from developed cystitis .

2- Terminal hematuria :

Due to bladder contraction over the stone at bladder neck.

3- Interruption of urinary stream :

If a stone is blocking the internal meatus .

INVESTIGATIONS As before

URETHRAL STONES

AETIOLOGY As before

PATHOLOGY

• Types of stones : As before.

CLINICAL PICTURE As before +

- 1- Ureteric colic few days ago.
- 2- Interruption of stream followed by retention of urine .

INVESTIGATIONS As before but **P**

• Plain X-ray shows

1- Stone posterior urethra i.e. behind symphysis pubis .







Treatment of urinary calculi

(A) Management during attacks of pain

- 1- Hospitalization may be necessary.
- 2- I.V analgesics (opiates) may be required.
- 3- Antispasmodic & anti-inflammatory like indomethacin.
- 4- Maintain divorces by administration of I.V. fluid & diuretics.
- 5- Antibiotics if there is suspicion of urinary tract infection.

(B) Management of urinary calculi

1- Treatment of renal stones

A- Medical (conservative) treatment

- Indications :

- ① Stone < 5 mm in diameter
- ② No evidence of back pressure effect.
- ③ No associated infection.

- Methods :

- ① The main item is high fluid intake.
- ② Intermittent course of diuretic & urinary antiseptics.
- ③ Alkalinization or acidification of urine according to the P.H

B- Instrumental treatment

- Indications :

- ① Stone **> 5 mm** or **growing** stone.
- ^② Evidence of back pressure or infection.
- ③ Persistent pain or gross hematuria.

- Methods :

① Extra-corporeal shock wave lithotripsy (ESWL).





2 Percutaneous nephrolithotomy (PCNL) .



③ Combined ESWL & PCNL.

1- Extra-corporeal shock wave lithotripsy (ESWL)

NDICATIONS In addition to above stone < 2 cm whether calyceal or pelvic</td> Image: stone < br/>book Image: stone < br/>book Simple" stones Image: stone < br/>book Simple" stones Image: stone < br/>book Image: stone < br/>book Image: stone < br/>book Simple" stones Image: stone < br/>book Image: stone Image: stone < br/>book Image: stone </td

CONTRAINDICATIONS

- ① Acute renal infection .
- ② Renal insufficiency .
- ③ Distal obstruction .
- \circledast Stones of lower calyx .
- S Pregnancy & bleeding tendency .
- ⑥ Spine abnormalities as Kyphosis or marked scoliosis (location of stone is very difficult)

Ultrasound shock waves

COMPLICATIONS " Very minimal "

- ① Transient attacks of hematuria .
- $\ensuremath{\textcircled{O}}$ Colicky ureteric pain .
- ③ Failure to disintegrate the stone .
- ④ Fever due to acute obstruction .

2- Percutaneous nephrolithotomy (PCNL)

INDICATIONS Nowadays is used when .

- ① ESWL is failed.
- $\ensuremath{\textcircled{}^\circ}$ $\ensuremath{\mathsf{ESWL}}$ is contraindicated .
- If stone > 2 cm it is indicated in combination with ESWL.

ADVANTAGES

- ① Small endoscopic wound.
- ② Mild post -operative pain .
- ③ Short hospital stay .

THE PROCEDURE

1- Access to renal pelvis :

By placing a guide wire through the flanks under sonographic guide then the tract produced by the wire is dilated to admit the nephroscope

2- Stone removal :

Direct removal through the nephroscope **if small** by stone forceps. but **if large** stone will need a prior disintegration by **ultrasonic laser** then removal through nephroscope.



C- Surgical treatment (open surgery)

- Indications :

Only for those patients whom are contraindicated to **ESWL** or failed with **PCNL**.

- The possibilities :

- 1- Pyelolithotomy for stone in renal pelvis .
- 2- Nephrolithotomy for stone in renal parenchyma .
- 3- Pyelonpherolithotomy : combined approach .
- 4- Lower partial nephrectomy : If stone impacted in lower calyx with narrowing of its neck

5- Nephrectomy : If non-functioning kidney provided that other kidney is functioning



2. Treatment of ureteric stones

A- Medical (conservative) treatment

- Indications :

- ① Stone < 5 mm in diameter
- ② No evidence of back pressure effect.
- 3 No associated Infection.

- Methods :

- 1) The main items is high fluid intake.
- ② Intermittent course of diuretic & urinary antiseptics.
- ③ Alkalinization or acidification of urine according to the P.H.

B-Instrumental & surgical treatment

- Indications :

- ① Stone > 5 mm or growing stone.
- ^② Evidence of back pressure or infection.
- ③ Persistent pain or gross hematuria.

- Methods :

Procedures for removal differ according to site of stone & its size

➡ UPPER 1/3 URETER

- Stone < 1 cm, it is pushed up to the kidney by a ureteric catheter & the ESWL is used.
- Stone > 1 cm, uretero-lithotomy (lumber incision)

➡ MIDDLE 1/3 URETER

- Uretero-lithotomy (Abernathy's incision)

⇒ Lower 1/3 URETER

- Stone < 1 cm, can be extracted by ureteroscopy (URS)
- Stone > 1 cm, uretero-lithotomy (suprapubic incision)

3. Treatment of urinary stones

According to the size of stone

A- Instrumental treatment (If stone < 2 cm). Can be crushed mechanically by the lithotrite (litholopaxy) as can be disintegrated by ultrasonic waves or electrohydraulic shock waves. The fragments are then lavaged outside the bladder

B- Surgical treatment (If stone > 2 cm)

OTHER INDICATIONS as P

- ① Multiple stones .
- ② Stone at a diverticulum .
- ③ Failure of crushing the stone .

Bladder Bladder Ureteral orifice showing bloody efflux

METHOD (**Cystolithotomy**) (suprapubic incision)

4- Treatment of urethral stones

According to the site of stone

1- PROSTATIC URETHRA

A **metal bougie** is passed along the urethra to dislodge the stone in bladder then managed as urinary bladder stone.

2- MEMBRANOUS URETHRA

Removed by a urethral forceps passed through a urethorscope

(C) Metabolic work up to prevent stone recurrence

1- The stone should be chemically analyzed.

2- The following investigation should be performed Pb

- a. Serum calcium & phosphorus to exclude hyperparathyroidisrn.
- b. 24 hours urine collection for normal level :
 - Oxalate < 40 mg Calcium < 300 mg Uric acid < 800 mg

3- Advices to given to patients with urinary calculi

- a. High fluid intake especially in hot weather.
- b. Certain precautions according to the type of the stone, to avoid cretin diets "see before".
- c. Treatment any metabolic disorder if possible e.g. Gout.

Obstructive uropathy

OBSTRUCTIVE UROPATHY

AETIOLOGY

According to the level of obstruction :

I. Pelvi-ureteric junction

- Idiopathic pelvi-ureteric junction obstruction (P.U.J.O)
- Stricture due to T.B.
- Stone .

II. Ureteral causes

- IN THE LUMEN : e.g. Calculi
- INSIDE THE WALL :
 - ① Congenital : e.g. Atresia .
 - ② Traumatic : e.g. Stricture following trauma .
 - ③ Inflammatory : e.g. Stricture following T.B
 - ③ Neoplastic : e.g. papilloma or carcinoma.

• OUTSIDE THE WALL :

- $\ensuremath{\mathbbm O}$ Infiltration by cancer cervix , colon or rectum .
- 2 Idiopathic retroperitoneal fibrosis .
- ③ Aberrant vessels.

III. Bladder causes

- Bladder neck obstruction (BNO)
- Neurogenic bladder.
- Tumor involving the bladder neck.

IV. Prostatic causes

- Benign prostatic hyperplasia .
- Carcinoma of the prostate .

V. Urethral causes

- Congenital : e.g. Meatal stenosis.
- Traumatic : e.g. Rupture urethra .
- Inflammatory : e.g. Post-gonococal infection

• Neoplastic : e.g. Polyps & carcinoma .



WE WILL STUDY

- 1- Hydronephrosis .
- 2- Benign prostatic hyperplasia (B.P.H)
- **3- Bladder diverticulum.**
- 4- Urethral stricture.



1- HYDRONEPHROSIS

DEFINITION

This is a chronic **aseptic** distention of the renal pelvis & calyces due to partial or intermittent obstruction of the urinary tract.

AETIOLOGY



PATHOLOGY There are 2 types P

Pelvic type	Renal type	
	-44	
This occurs when the obstruction is high	This occur when the obstruction is low	
IN ADVANCED CASES The pelvis forms one large chamber with the kidney capped over a part of it.	IN ADVANCED CASES The kidney becomes transformed Into a lobulated sac with rounded bosses.	

CLINICAL PICTURE

In addition to picture of cause

- 1- Pain : Slight dull aching pain or discomfort in the loin .
- 2- Swelling : In late cases.
- **3- Urine** : There is often polyuria of low specific gravity. i.e. Mal-functioning kidney .

COMPLICATIONS

- 1- Infection i.e. pyonephrosis (2^{ry} type)
- 2- Rupture of kidney .
- 3- Stone formation .

4- Renal insufficiency (failure) if bilateral.

INVESTIGATIONS

1- Laboratory investigations

Urine analysis, blood urea & serum creatinine

2- Radiological investigations

- 1. I.V.U shows ₹>
 - ① Dilatation of renal pelvis .
 - ^② Clubbing or ballooning of the calyces.
 - ③ Distortion of pelvi-ureteric junction.
 - Ureteric stricture.
 - © Delayed or no excretion if advanced.





2 - Ascending pyelography : If failed I.V.U

3- U/S & CT scan (diagnostic).
 To visualize The kidney & the degree of obstruction.

3- Instrumental (cystoscopy & urethroscopy)

To exclude any abnormalities in bladder & urethra.

TREATMENT

1-1st removal of the cause of obstruction.

2- In case of pelvi-ureteric junction obstruction

- Treatment :

By [**Androson – Hyne's**) operation This entails excision of proximal part of ureter & redundant pelvis.

3- Nephrectomy :



if the kidney is damaged provided that other kidney is functioning.

2- BENIGN PROSTATIC HYPERPLASIA (B.P.H)

Senile enlargement of the prostate (S.E.P)

INCIDENCE

It affect **50 %** of males **> 50** years

AETIOLOGY

Unknown but may be hormonal imbalance stimulating the transition zone prostatic cells to undergo hyperplasia.

PATHOLOGY

N/E picture

The prostate is divided into zones .

- 1- Anterior fibromuscular stroma.
- 2- Peripheral zone.
- 3- Central zone.

4- Transition zone (Periurethral zone)

It is the transition zone which is the origin of the **B.P.H**., with development of nodules that enlarge & compress the urethra

Microscopic picture

Hyperplasia of glandular, fibrous & muscular elements

PATHO-PHYSIOLOGY

On developing **B.P.H** the nodules may differentiate into lateral & middle lobes that obstruct both urethra & bladder neck

A- The urethra

- Elongated, narrowed as it is compressed laterally .
- The normal posterior curve of the urethra is exaggerated

B- The urinary bladder

- Early : The muscle of the bladder undergo hypertrophy to overcome obstruction (i.e. S.E.P) causing trabeculation & diverticulum.
- Later on the bladder becomes dilated from chronic retention (residual urine) → Atony.

C- Ureter

- Early : The muscle of the ureter undergo hypertrophy.
- Later on the ureter becomes dilated from atony

C- kidney

- Hydronephrosis i.e. due to back pressure.









A- Symptoms of uncomplicated cases

- 1. Frequency :
 - At 1st nocturnal from pelvic congestion, later on becomes both nocturnal & diurnal from complications
 - Causes of frequency:
 - Elongation of posterior urethra & exposure of this sensitive mucosa to the urine.
 - ② Stretch of the internal sphincter allow few drops of urine to escape in the posterior urethra leading to **urgency**
 - ③ Presence of residual urine
 - ④ Complications as cystitis, stone or diverticulum .

2. Difficulty :

- To start : The strain will lead to congestion of prostate → more obstruction so straining 11 the obstruction and so the patient learns to be relax i.e. Hesitancy .
- To maintain : Because the stream is weak, interrupted & forked.
- To terminate : Dribbling of urine from residual urine .

3. Sexual symptoms :

- At 1st there is 11 lipido, but later on impotence may occur.

B- Symptoms of complicated cases

- General :
 - Chronic renal failure with neglected cases.
- Local :
 - Acute retention of urine may be the 1st. presentation. from congestion of the bladder neck.
 - Chronic retention of urine with over flow from 11 residual urine
 - Hematuria (rupture of prostatic veins), cystitis, stone ...etc.

C-Examination

- General examination :

For evidence of uremia (if renal failure)

- Local examination :

- Abdomen : For renal mass if late hydronephrosis .
- Urinary bladder : For supra-pubic fullness from retention .
- - Smooth surface .
 - Firm in consistency
 - Symmetrical enlargement.
 - Sulci between lobes are accentuated.
 - Sliding of rectal mucosa over the prostate .



1- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

2- Radiological investigations

1. I.V.U shows ₹>

- ① Smooth basal filling defect in the bladder
- ⁽²⁾ Any hydronephrotic changes of kidney.
- ③ Any bladder diverticulum.

2. Trans-rectal ultrasound (T.R.U.S)

- ① Detect non palpable malignancy
- $\ensuremath{\textcircled{}^{\texttt{O}}}$ Assess the size of enlargement.
- ③ U/S guided biopsy may be taken .

3- Instrumental (cystoscopy & urethroscopy)

To exclude bladder pathology especially vesical piles.

4- Flowmetry

A maximum flow rate < 15 ml / sec indicate obstruction.

TREATMENT

A- Conservative treatment

Since the natural history of **B.P.H**. is not uniform, patients with minimal symptoms & no complications may remain such for years.

\Rightarrow These patients may be placed on \Rightarrow

1- Watchful waiting :

Close follow-up & **advice** to avoid wine & with holding micturation for long period

2- Medical treatment & watchful waiting :

① α -Blockers (Trasocine & prasocine) :

They improve symptoms, particularly frequency

@ 5- α -reductase inhibitors (**Proscar**) :

It improves patients' symptoms & actually **++** the size of the enlarged prostate. In patients who improve on **proscar**, the drug is to be continued for life.

B- Surgical treatment

INDICATIONS

- ① Distressing frequency.
- ^② Difficulty in micturation .
- ③ Acute retention of urine .
- ④ Chronic retention of urine .
- S Hematuria, cystitis, diverticulumetc.

THE IDEA OF SURGERY

To remove the adenomatous enlargement from inside the false capsule of compressed prostatic tissue.





METHODS OF SURGERY

1- Endoscopic surgery.

2- Open surgery

1- Endoscopic surgery

1. Trans-urethral resection (TUR)

- Using the **cysto-resectoscope**. The prostate is removed piece by piece using electric cutting.
- It is the operation of choice for the majority of patients.
- The only limitation is large adenoma because of hazardous result.

- Complications = TUR syndrome :



This is dilutional hyponatremia that results from over absorption of irrigating fluid during *Trans-urethral resection* (TUR) to clear the field from blood. so uses of glycine for irrigation diminish this possibility.

2. Visual laser ablation of prostate (V.L.A.P)

- Through a **cystoscope** a non-contact laser probe is used to evaporate the obstructing adenoma.
- It is a bloodless procedure with only a drawback of incomplete removal with possible recurrence.

3. Trans-urethral vaporization :

- Using high energy electric heating.

2- Open surgery

1. Trans-vesical prostatectomy

- Through a **midline supra-pubic incision**. The urinary bladder is opened, the index finger is inserted into the bladder neck, and so the adenoma is enucleated

2. Retro-pubic (Millin's) prostatectomy

- Through a **midline supra-pubic incision**. The retro-pubic space is exposed (by cutting) the pubo-prostatic ligaments. but the bladder is not opened, the adenoma is enucleated

Complications of surgery

- ① Bleeding + clot retention .
- ② **Incontinence :** in 1 : 10.000 because of damaged internal sphincter.
- ③ Retrograde ejaculation because of damaged internal sphincter.
- Impotence : (2 5 %) due to injury of pudendal nerve fibers in the region of posterior urethra.
- **⑤ Urethral stricture**.
- [©] Infection : leading to urethritis & cystitis .







3- URINARY BLADDER DIVERTICULAE

DEFINITION

It is a flask shaped protrusion through the muscle wall of urinary' bladder.

AETIOLOGY & TYPES

A- Congenital diverticulum (Rare)

- It is solitary & located medial to & above the ureteric orifice
- It has **muscle fibers** within its wall i.e formed of all layers of bladder.
- It is **contracted** during micturation.

B- Acquired diverticulum (Common) -

- They are often **multiple** & always associated with distal obstruction & trabeculation of the wall of bladder.
- They have no muscle fibers within their wall
- They are **not empty** during micturation.

CLINICAL PICTURE

• There are **no specific symptoms** but acquired diverticulae may be filled with urine & subsequently empty into the bladder producing an Immediate desire to pass urine as a second time after the end of micturation so it is called (**double micturation**).

COMPLICATIONS

Stagnation of urine in the diverticulum may result in 🏞

- Infection.
- ② stone formation.
- ③ Squamous metaplasia.
- ④ Rarely, squamous cell carcinoma.

INVESTIGATIONS

1- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

2- Radiological investigation

- Cystography (Ascending or descending) Shows the diverticulae

3- Instrumental (cystoscopy)

To demonstrates diverticular opening in the bladder.



TREATMENT

Excision if complicated or producing ureteric obstruction.



4- URETHRAL STRICTURE

- ① Congenital : e.g. Meatal stenosis.
- ^② **Traumatic :** e.g. Rupture urethra.
- ③ Inflammatory : e.g. Sexual transmitted disease e.g. gonorrhea.
- Neoplastic : e.g. Polyps & rarely carcinoma.

CLINICAL PICTURE

- ① **Difficulty** in micturation.
- ^② **Frequency** due to incomplete evacuation of the bladder.
- ③ Retention of urine (acute & chronic)

COMPLICATION

- ① Peri-urethral fistulae & abscesses.
- ② Infertility .
- ③ Prostitis .

INVESTIGATIONS

1- Laboratory investigations

- Urine analysis, blood urea & serum creatinine

2- Radiological investigation

- Urethrography

Shows the site, length & shape of stricture.

3- Instrumental (urethroscopy)

Shows the site & extent of stricture.



4- Uroflometry Reveals obstructed flow of urine through the urethra.

TREATMENT

1- Urethral dilatation : regular & over multiple sittings .

2- Endoscopic visual internal urethrotomy :

Through a **urethroscope**, the stricture is incised with a sharp knife blade usually at **12 o'clock position** then left to heal .

3- Urethroplasty :

The Idea is to excise the fibrous tissue of the stricture then constructing the urethra using skin flaps from penis, scrotum or perineum over a catheter

Tumors of the urinary tract



due to high lipid content of the cells with areas of hemorrhage & necrosis.

Microscopic picture

Adenocarcinoma of cells of proximal convoluted tubules (P.C.T)

- There are 2 types :

① Clear cell type as cholesterol crystals are dissolved during preparation by alcohol.

② Granular cell type due to increased mitochondria in the cytoplasm of the cells.

SPREAD

Direct spread To renal pelvis, Zukercandle's fascia......etc.

Lymphatic spread To hilar L.Ns to para-aortic to cysterna chyli to thoracic duct & finally Lt. supra clavicular L.Ns i.e. Virchow's gland.

Blood spread

- Embolization : To lung (cannon ball), boneetc.
- Permeation : Growing to the lumen of renal vein to I.V.C & testicular veins

STAGING ROBSON STAGING SYSTEM

- **Stage I** : Tumor confined to the kidney.
- Stage II : Tumor invades Zukercandle's fascia & peri- nephric fat.
- Stage III : Tumor involves the renal vein + regional L. Ns.
- Stage IV : Distant metastasis.

CLINICAL PICTURE

Age 50 - 70 years.

Presentation

A- Typical presentation :

- 1- Hematuria : Total, painless, profuse, recurrent 50 % of cases
- 2- Pain : In 40 % of cases. It may be due to P>
 - Stretch of renal capsule.
 - Passage of blood clot causing ureteric colic.
 - Infiltration of adjacent lumbar nerves.
- 3- Renal mass : In 30 % of cases irregular, hard renal swelling.
- N. B: Metastasis may be the 1st presentation

B- Atypical presentation :

- 1- Fever, weight loss, night sweat or anemia.
- 2- 2^{ry} varicocele which doesn't empty by elevation of the scrotum.
- 3- Systemic (Para-malignant syndrome).
 - Hypercalcemia :

In 5 % of cases due to secretion of parathormone like substance by the tumor or bone metastasis.

- Polycythemia :

Due to increased renal erythropoietin

- Amyloidosis .



INVESTIGATIONS

1. Laboratory investigations

① Urine analysis for R B Cs

2 Blood urea & serum creatinine .

2. Radiological investigations

1- Plain x-ray :

- may shows soft tissue shadow + Mottled calcification of the tumor.
- 2 I. V.P : Shows -
 - Enlargement of the kidney.
 - Elongation, compression or amputation of a calyx.
 - Displacement of the renal pelvis.
- 3- U/S & CT scan (diagnostic) Shows size, nature & extent of involvement of surroundings.

3. Metastatic work-up

e.g. Chest X-ray & bone scan.

TREATMENT

A- Operable (Stage I & II) Radical nephrectomy

Removal of \Im

- ① Kidney & supra-renal gland.
- ^② The Zukercandle's fascia.
- ③ The peri-nephric fat.
- ④ Regional L.Ns.
- ⑤ Upper 1/3 ureter.

N.B. : Legate the vascular pedicle

As 1st step of operation for 2 reasons :

- 1- Prevention of dissemination of malignant cells during manipulation of the tumor.
- 2- To be able to remove a malignant thrombus from I.V.C if present,

B- Inoperable (Stage III & IV)

- Resectable :

Palliative nephrectomy

- Irresectable :

Chemotherapy (Alpha or Gamma interferon) & **Radiotherapy**.






2- Wilm's tumor

Nephroblastoma

INCIDENCE

- Represents 10 % of childhood malignant tumors
- Age : 90 % (< 7 years) & the peak (3 4 years)
- Sex : Male = female

PATHOLOGY

Site Commonest at upper pole

N/E picture

- Shape : Solitary encapsulated mass.
- Size : Huge size.
- Cut section shows area of hemorrhage & necrosis.

Microscopic picture

Mixed tumor i.e. containing epithelial & C.T cells,

SPREAD

Direct spread To renal pelvis (**rare**), Zukercandle's fascia.....etc.

Lymphatic spread much less common

Blood spread To lung, bone, brain.....etc.

STAGING (POST- NEPHRECTMY STAGING) for further treatment

- **Stage I** : Tumor confined to the kidney.
- Stage II : Tumor extends beyond the kidney but completely excised.
- Stage III : Residual tumor confined to abdomen
- Stage IV : Distant metastasis
- Stage V : Bilateral renal involvement at diagnosis

CLINICAL PICTURE

Age 1st 3 - 4 years of life.

Presentation

- 1- Renal mass : In 90 % confined to one side of abdomen
- 2- Hematuria : In 50 % of cases
- 3- Pain : In 40 % of cases.
- 4- Hypertension : It results from renal ischemia & renin production

Anomalies associated with Wilm's tumor

1- Increase the incidence of neurofibromatosis .

2- Genito-urinary anomalies

as renal hypoplasia, hypospadius or crypto-orchidism.







INVESTIGATIONS

1. Laboratory investigations

0 Urine analysis for R B Cs

2 Blood urea & serum creatinine .

2. Radiological investigations

1- Plain x-ray :

- may shows soft tissue shadow + Mottled calcification of the tumor.
- 2 I. V.P : Shows
 - Enlargement of the kidney.
 - Elongation, compression or amputation of a calyx.
 - Displacement of the renal pelvis.
- 3- U/S & CT scan (diagnostic) Shows size, nature & extent of involvement of surroundings.

3. Metastatic work-up

e.g. Chest X-ray & bone scan.

TREATMENT

- Radical nephrectomy if possible

Removal of $\stackrel{r}{\rightarrow}$

- ① Kidney & supra-renal gland.
- ^② The Zukercandle's fascia.
- ③ The peri-nephric fat.
- ④ Regional L.Ns.
- ⑤ Upper 1/3 ureter.

N.B. : Legate the vascular pedicle

As 1st step of operation for 2 reasons :

- 1- Prevention of dissemination of malignant cells during manipulation of the tumor.
- 2- To be able to remove a malignant thrombus from I.V.C if present,

- Irresectable :

Chemotherapy then re-exposure

because the tumor is usually can be removed

Scheme for post-operative management

- If no residual focal lesion :

Chemotherapy using Actinomycin D, Vincristin & Adriamycine

- If residual focal lesion : Chemotherapy & radiotherapy







B- TUMORS OF RENAL PELVIS

1 - Transitional cell carcinoma

Urothelial tumor

INCIDENCE

7 % of renal tumors.

PATHOLOGY

It is spreading by **implantation** so patient with **T.C.C** has **30** % chance of developing the same lesion in the bladder & **2** % in contra-lateral side.

CLINICAL PICTURE

Gross or microscopic hematuria in 90 % of cases.

INVESTIGATIONS

A- Laboratory investigations Urine analysis, blood urea & serum creatinine

B- Radiological investigations

- 1- I. V. P : shows filling defect in renal pelvis.
- 2- U/S & CT scan (diagnostic)



TREATMENT

Total nephro-ureterectomy

with excision of part of uretro-vesical junction.

2- Squamous cell carcinoma

- It is resulting from metaplasia caused by long standing irritation e.g. **stone**.
- It is associated with infection.
- It is usually inoperable & radio-resistant (The worst prognosis).



	SQUAMOUS CELL	TRANSITIONAL CELL
	CARCINOMA	CARCINOMA
	" BILHARZIAL "	" NON BILHARZIAL "
INCIDENCE	40 %	55 %
• Age : • Sex :	• Male > female	• Male > female
PREDISPOSING FACTORS	 Mechanical irritation by the bilharzial ova. Abnormal tryptophan metabolism by bilharzial 	1- Industrial carcinogens : - Aniline dyes. - Aromatic amines. 2- Cigarettes smoking
	worm → carcinogenic	3. Polyic irradiation
	Compounds.	4- Prolonged intake of large
	with bilharzial cystitis lead	doses of phenacetin .
	to squamous metaplasia.	5- Cyclophosphamide
	 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established "
PRE- CANCEROUS LESIONS	 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia. 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established " 1- Ectopia vesica. 2- Urachal diverticulum
PRE- CANCEROUS LESIONS PATHOLOGY • Site	 to squamous metaplasia. 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia. Common in posterior & lateral wall & rarely in the trigone. 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established " 1- Ectopia vesica. 2- Urachal diverticulum Common in base, trigone & around the ureteric orifices
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PRE- CANCEROUS LESIONS PATHOLOGY • Site	 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia. Common in posterior & lateral wall & rarely in the trigone. 60 85% 10% 5% 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established " 1- Ectopia vesica. 2- Urachal diverticulum Common in base, trigone & around the ureteric orifices 0 % 6 % 4 %
PRE- CANCEROUS LESIONS PATHOLOGY • Site	 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia. Common in posterior & lateral wall & rarely in the trigone. 5% 10% 5% Nodular fungating (85 %) 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established " 1- Ectopia vesica. 2- Urachal diverticulum Common in base, trigone & around the ureteric orifices 90 % 6 % 4 % Papillary tumor (90 %)
PRE- CANCEROUS LESIONS PATHOLOGY • Site • N/E	 4- 11 B- glucuronidase enzyme which transforms non-carcinogenic into carcinogenic compounds Brunn's nests, cystitis cystica, cystitis glandularis & squamous metaplasia. Common in posterior & lateral wall & rarely in the trigone. 5% Nodular fungating (85 %) Malignant ulcer (10 %) 	 5- Cyclophosphamide 6- Artificial sweeteners e.g. saccharin. " Not well established " 1- Ectopia vesica. 2- Urachal diverticulum Common in base, trigone & around the ureteric orifices 90 % 6 % 4 % Papillary tumor (90 %) Nodular fungating (6 %)

Carcinoma of the urinary bladder

Bilharzial carcinoma of the bladder is the commonest malignant tumors in Egypt.

	SQUAMOUS CELL	TRANSITIONAL CELL	
	CARCINOMA	CARCINOMA	
	" BILHARZIAL "	" NON BILHARZIAL "	
• M/E	Squamous cell carcinoma	Transitional cell carcinoma	
		 N.B. 1 : According to the degree of cellular differentiation T.C.C. is classified into [™]> Grade I : Well differentiated. Grade II : Moderate differentiated. Grade III : Poorly 	
		differentiated.	
SPREAD		N.B. 2 : According to the depth of bladder wall invasion T.C.C is classified into → - Superficial T.C.C - Deep T.C.C : Invading the muscle wall.	
Direct	Delayed due to calcification	Early as there is no calcification	
	From mucosa to muscle coat then to the surroundings		
Lymphatic	 Upwards : Peritoneum & bowe Downwards : Urethra. Laterally : Pelvic bone. Posteriorly : Male → Rectum, seminal ve & recto-vesical pour Female → Rectum, vagina & 	el esicle ch. & uterus. es L.Ns → Para-aortic L.Ns.	
Blood	l ate		
STAGING	Wallace classification with squamous cell carcinoma (based on clinical exam.)		
	T_0 : No palpable mass.		
	T ₁ : Palpable mobile mass but no induration of bladder wall i.e. no invasion of muscle coat.		
	T2: Palpable mobile mass with	induration of bladder wall.	
	T ₃ : Palpable mobile mass with	extra-vesical spread.	
	T ₄ : Fixed bladder mass to surr	oundings.	
		T3 T4	

	SQUAMOUS CELL	TRANSITIONAL CELL		
	CARCINOMA	CARCINOMA		
	" BILHARZIAL "	" NON BILHARZIAL "		
COMPLICATIONS	1- Uremia & ascending pyelonephritis (cause of death).			
	2- Obstruction leads to hydroureter & hydronephrosis.			
	3- Uncontrolled hematuria.			
	4- Distant metastasis.			
C/P	With history of bilharziasis Without history of bilharzias			
Symptoms	1- chronic cystitis in the form of burning micturation.	1- painless hematuria.		
	2- Painful hematuria.	2- Cystitis is later due to 2 ¹⁷ infection		
	Necroturia (tissue sloughs) & supra-pubic dull ache pain.			
Signs	- General examination : For uremia & metastasis.			
	- Abdominal examination : For renal mass if hydronephrosis, or splenomegaly if bilharziasis.			
	- P/R & bimanual examination : For site, size, extent & mobility of mass.			

INVESTIGATIONS

1. Laboratory investigations

① Urine analysis for R B Cs, malignant cells & necrotic tissues

2 Blood urea & serum creatinine .

2. Radiological investigations

1- Plain x-ray :

Shows soft tissue shadow or calcified bladder with squamous cell type only.

2 - I. V.U or ascending cystography Shows irregular filling defect ______ of the bladder.

3- U/S & CT scan (diagnostic) Shows size, nature & extent of involvement of the surroundings.

3- Instrumental (cystoscopy)

To visualize the lesion & to take a biopsy.

4. Metastatic work-up

e.g. Chest X-ray & bone scan.



TREATMENT

According to type of carcinoma :

A- Treatment of squamous cell carcinoma

- In Egypt usually late presentation + chemo & radio-resistant tumor .
- So the best is TOTAL RADICAL CYSTECTOMY + URINARY DIVERSION
- In the operation, we remove [∞]
 - ① The urinary bladder.
 - ^② Overlying peritoneum
 - ③ Peri-vesical fat.
 - ④ Lower 2 inches of ureters.
- Then In male : we remove prostate & seminal vesicles. In female : we remove uterus, fallopian tubes & ant. vaginal wall.
- Then bilateral Iliac L.Ns dissection occur in both sex.

B- Treatment of transitional cell carcinoma

• According to the depth of invasion of the bladder wall .

1 - Superficial (T.C.C)

1. Trans-urethral resection (T.U.R) :

Excision of the tumor with the underlying muscle + multiple mucosal biopsies to detect carcinoma in situ.

2. LASER irradiation :

Using N.d YAG laser through cystoscope.

3. Intra- vesical chemotherapy :

To prevent recurrence, it is used with grade II & III tumors.

N.B.: Regular follow up for 5 years to detect recurrence so if recurrence occur we do **radical cystectomy**.

2 - Deep (muscle invasive) (T.C.C)

- **1. Radical cystectomy :** differs from that described for **S.C.C** in only one step, the urethra has to be removed because of the tendency of (**T.C.C**) to spread along the urethra.
- 2. Radio-therapy :

The results are less successful than surgery.

3. Chemotherapy :

For metastasis.

The best combination is "M.V.A.C "

- Methotrexate
- Vinblastine
- Adriamycin
- Cis-platin

URINARY DIVERSION

INDICATIONS

- 1- Cystectomy, ectopia vesica & irremovable obstruction.
- 2- Loss of sphincteric control.
- 3- Incurable vesico-vaginal fistula.

METHODS

I- Uretro-cutaneous implantation

- It is rarely performed nowadays
- It has the following disadvantages :
 - ① Stomal stenosis.
 - ^② Ascending infection of the kidney.
 - ③ Excoriation of skin by continuous urine leak.

II- Uretro-colic anastomosis It is simple & rapid

- The 2 ureters are anastomosed to sigmoid colon
- It has the following disadvantages :
 - ① Recurrent upper urinary tract infections.
 - ② Deterioration of renal function.
 - ③ Hyper-chloremic acidosis as a chlorides in urine can by absorbed by colonic mucosa.
 - ④ Hypokalemia.

⑤ Encephalopathy : Urea in urine is act upon the intestinal flora leading to formation of excess ammonia.

© Carcinoma of the colon 30 % after 10 years.

III- Ileal conduit

- A segment of terminal ileum is isolated with intact blood supply. the 2 ureters are implanted in it then the distal end of Ileal loop is closed & the proximal end of ileal loop is fixed to skin.
- It has the **following advantages :** No urine leakage & no infection
- It has the following disadvantages : Hyper-chloremic acidosis may occur but is less severe than uretro-colic Anastomosis.

IV - Rectal bladder

- The sigmoid colon is divided above the recto-sigmoid junction. then the distal end is closed & the proximal end is brought out as colostomy.
- The 2 ureters are implanted in the rectum which will now work as a urinary bladder.

V- Continent urinary diversion (Recto-cystoplasty)

- The idea is to separate a segment of bowel with its blood supply & anastomoses this segment to the bladder neck or the remnant of urethra to perform a new urinary bladder.











III - TUMORS OF PROSTATE

Cancer prostate

INCIDENCE

The commonest malignant lesion affecting males > 65 years.

AETIOLOGY Unknown

But it is probably related to long standing androgen stimulation.

PATHOLOGY

- Site : The majority of neoplasm (75 %) arise from the peripheral zone.
- N/E picture : Hard irregular nodule with areas of Hae & necrosis.

- Microscopic picture :

95 % Adenocarcinoma.

5 % Transitional carcinoma from prostatic urethra.

SPREAD

Direct spread

To seminal vesicles, peri-prostatic tissues & rarely to rectum because of strong (fascia of Denonvillier) between rectum & prostate.

Lymphatic spread

To internal & external iliac L.Ns \rightarrow Para-aortic L.Ns.

Blood spread

90 % are bone metastasis (Ribs, lower vertebrae, pelvis, neck of femur) they are usually osteoblastic

N.B.: Bone metastasis is due to the reversal of blood flow from vesico- prostatic venous plexus to the valveless emissary veins of the pelvic bone during coughing.

STAGING T N M

T = Tumor	N = Nodes	M = Metastases
T ₀ = No mass.	N ₀ = No L.Ns	M ₀ = No
T ₁ = Nodule in the lobe.	N₁ = Involvement one regional	metastasis
T ₂ = Diffuse disease.	L.Ns.	M ₁ = Metastasis
T ₃ = Extension to seminal vesicles.	N ₂ = Involvement several regional L.Ns.	
T_4 = Lesion is fixed to	N ₃ = Fixed regional L.Ns.	
other tissues.	N ₄ = Involvement of common iliac or para-aortic L.Ns.	



Prostate cancer

CLINICAL PICTURE There are different presentations of this disease P

1- Pathological surprise :

Diagnosed clinically as S.E.P & discovered by histopathology after enucleation as to be cancer.

2- Urinary outflow obstruction :

Short history of difficulty, incontinence, hematuria or painful micturation in male > 65 years.

- **3- Metastasis :** May be **1**st presentation i.e. occult carcinoma. ① **Metastasis to spine :** Backache, pathological fracture
 - or paraplegia.
 - ^② Invasion to sciatic nerve : Sciatica.
 - ③ Invasion to iliac veins : Edema of one or both legs.

4- P/R examination : shows ₹

- Irregular surface .
- Hard in consistency
- Asymmetrical enlargement.
- Sulci between lobes are obliterated.
- Inability to slide rectal mucosa over the prostate .

INVESTIGATIONS

1. Laboratory investigations

① Urine analysis, blood urea & serum creatinine

② Prostatic specific antigen (PSA)

The most useful marker in the diagnosis & follow up but it may be raised in S.E.P or prostatitis.

- ③ Acid phosphatase enzyme : (N = 0 3 king/Armstrong unites)
 - So If 3 5 units are suggestive.
 - If 5 -10 units are diagnostic.
 - If > 10 units it means metastasis.
- ④ Alkaline phosphatase enzyme : 11 with bone & liver metastasis .

2. Radiological investigation

1- I. V.U :

Shows **irregular filling** defect at base of the bladder

2- Bone scan : Hot spots indicates metastasis.

3- CT scan pelvis :

To detect pelvic L.Ns deposits but not accurate.

2. Trans-rectal ultrasound (T.R.U.S)

To detect non palpable malignancy in peripheral zone.

3. Metastatic work-up

e.g. Chest X-ray & bone scan.





TREATMENT

1- Radical prostatectomy

Indicated only with localized disease & fit patient.

2- Irradiation

Indicated only with advanced disease & unfit patient, also if symptomatic metastasis as it produces dramatic relief of pain.

3- Trans-urethra resection

Indicated only with patients who have urinary out-flow obstruction & unfit for major surgery i.e. palliative treatment.

4- Hormonal therapy

for (majority of cases)

Cancer prostate is an androgen sensitive tumor

so there are different methods of androgen ablation.

- ① Bilateral orchidectomy.
- ② Luteinizing hormone releasing hormone (LHRH) agonist (Zoladex). the drug causes initial rise of testosterone then a drop to castrate level.
- ③ Anti-androgens (Nutilamide).

They act by blocking testosterone receptors by competitive inhibition.

④ **Stilbesterol** A small dose 1 mg t.d.s is used.

PROGNOSIS

Early cases without metastasis

Have **good** prognosis (the **minority**).

Late cases with metastasis

Have **poor** prognosis (the **majority**)

TESTIS & SCROTUM



TESTIS & SCROTUM

EMBRYOLOGY

- It arises in lumbar region from the mesodermal genital ridge deriving its blood supply from aorta & it's nerve supply from T₁₀ -T₁₂ segments.
- It migrates downwards, forwards & medially, pass through the inguinal canal carrying with it a fold of peritoneum (**PROCESSUS VAGINALIS**).

 N. B.: The testis reaches the following : The internal ring at 6th month (intra-uterine).
 The external ring at 8th month (intra-uterine).
 The bottom of scrotum at 9th month

FACTORS RESPONSIBLE FOR TESTICULAR DESCENT

1- Cranial segment of the body grows faster than caudal segment.



2- Maternal & pituitary gonadotropin (HCG).

3- Gubernaculum

Which is a **fibro-muscular band** connecting the lower pole of the testis to the bottom of the scrotum guiding the testis into the scrotum











- 1- **Sterility** in bilateral cases due to failure of spermatogenesis from higher abnormal temp.
- 2- Severe pain <u>+</u> shock if torsion testis occur.
- 3- Recurrent trauma leads to atrophy of testis especially if inguinal.
- 4- Oblique inguinal hernia in 75 % of cases.

B- General complications

- 1- Psychological disturbance.
- 2- Epididymo-orchitis.
- 3- Testicular malignancy especially if intra-abdominal.

CLINICAL PICTURE

- The ipsilateral side of scrotum is empty & undeveloped
- The testis may be felt in abnormal place (along normal line of descent)
- An associated hernia may be present.

D.D From ectopic & retractile testis (see **next** page)

INVESTIGATIONS

1- Hormonal assay e.g. L.H & testosterone in the blood, to exclude causes of anorchia in bilateral cases (i.e. crypto -orchidism)

2- U/S & CT scan To localize the site of testis.

3- Laparoscopy To detect intra-abdominal testis.

TREATMENT

Surgical Treatment (Orchidopexy)

TIMING Best age between **1-2 years**.

ANESTHESIA General

POSITION Supine



INCISION Inguinal incision to open the inguinal canal



STEPS

A - Mobilization of the vas deferens & testicular vessels

- Any associated hernia is dealt with.
- Cord elongation by dissecting it high up & cutting any bands.

The aim of the above mentioned steps is to gain length of spermatic cord & help testicular descent.

B - Fixation & Retaining the mobilized testis in the scrotum

- 1- Dartos pouch : By putting the testis between the skin of scrotum & dartos muscle (see fig .1).
- 2 Bevan's operation : A stitch is passed from tunica albuginea to the skin of scrotum (see fig. 2).
- **3 –Ombredanne's operation :** The mobilized testis is brought through an opening in the septum (see fig. **3**).





DEFINITION

Testis which normally developed, passed out the external ring, but instead of reaching the scrotum, it passes a subcutaneous **ectopic** position.

AETIOLOGY

It may be due to pull of an accessory gubernaculum

PATHOLOGY The sites of ectopic testis :

- ① Inguinal : Superficial to the apponeurosis of the muscle
- 2 perineal.
- ③ Pubo-penile : Root of the penis.
- ④ Femoral : In the femoral triangle.





TREATMENT

Replacement of the testis in the scrotal bed.

3- Retractile testis

- ⇒ The condition occurs in young child due to exaggerated cremasteric reflex.
- - ② The testis can be pushed into scrotum with squatting position or (chair test)
- \Rightarrow **No** treatment is required.

⇒ DD of empty scrotum

- 1- Retractile testis (the commonest).
- 2- Undesecended testis
- 3- Ectopic testis
- 4- Surgically removed
- 5- Agenesis.



II- INGUINO-SCROTAL DISEASES

1- Varicocele

DEFINITION

It is multiple, dilated, elongated & tortuous veins of pampiniform plexus.

1^{ry} Varicocele

AETIOLOGY

- ① Congenital weakness of wall of veins
- ^② Congenital absence of valves.
- ③ Prolonged sitting or standing.
- ④ Chronic constipation or straining at stool.
- © Unrelieved sexual desire.

SITE

It occurs at Lt.. Side (95%) why ? Because 🔁

- ① LT, TESTICULAR VEIN opens into the Lt. renal vein at right angle which has no protective valves.
- ② LT, TESTICULAR VEIN lies beneath the sigmoid colon & so liable to compression.
- ③ LT, TESTICULAR VEIN be longer because the Lt. testis usually lies at lower level

COMPLICATIONS

- ① Infertility especially bilateral can reduce the sperm count or vitality. This is due to the higher temperature in the scrotum produced by venous congestion.
- ^② Recurrent attacks of thrombophlebitis.
- Testicular atrophy.
- S Neurosis.

EXAMINATION

A-Inspection

- 1- **Swellings** are multiple, elongated & tortuous inguino-scrotal swelling, commonly at **Lt**. side.
- 2- Sagging skin over.
- 3- **Inguinal region** may shows **O.I.H** as a weak mesenchyme.
- 4- Scrotum shows Lt. side hangs lower than Rt. side.
- 5- Penis shows no anomalies







B- Palpation

- Swellings are multiple, elongated & tortuous inguino-scrotal swelling, commonly at Lt. side. with palpable thrill on cough due to reversed venous flow
- 2- Tender skin over if thrombophlebitis.
- 3- Inguinal region
- 4- Scrotum.

as inspection

- 5- Penis
- 6- Tunica vaginalis may show minimal effusion which is tested by " pinching test ".
- 7- Testis : May be small & soft if atrophied.
- 8- Epididymis : normally felt.
- 9- Spermatic cord : We felt bag of worms

C- Special test (BOW TEST)

If the examiner lightly holding the varicocele between the fingers & thumb, then the patient is instructed to bow. The tension within the veins becomes obviously **less**

INVESTIGATIONS

1- Doppler & duplex scan can detect reversal of the blood flow in testicular vein (incompetent valves).

- Grading I Present only with valsalva
 - II Present without valsalva
 - III Visible
- 2- Semen analysis : In case of infertility.

TREATMENT

A- Conservative treatment

- ① Avoid straining & treatment of constipation.
- ② Scrotal suspender better avoided
- ③ Sexual life is regulated
- ④ Patient takes frequent cold paths.

B- Surgical treatment

INDICATIONS

- ① Large sized painful varicocele.
- ② Oligospermia
- ③ Failure of medical treatment.

PRINCIPLES

- $\ensuremath{\textcircled{}}$ Trans-fixation excision
- ② Multiple ligature (**Delta**) operation.
- ③ High abdominal (Palomas) ligation.



See operative details





2^{ry} Varicocele

AETIOLOGY

It is due to obstruction of testicular veins high up in abdomen as hypernephroma or after herniorrhaphy



Scrotum

Hydrocele

	1 ^{ry} varicocele	2 ^{ry} varicocele
≻ Age.	• 15 - 25 years	 > 40 years
On lying down.	 Disappears 	 Not disappear
> Abdominal exam.	• No swelling.	Present
		e.g. hypernephroma.

INVESTIGATIONS

- **1- Doppler & duplex scan can** detect reversal of the blood flow in testicular vein (incompetent valves).
- 2- Semen analysis : In case of infertility.

.....

TREATMENT

Treatment of the cause



.....

Normal

Anatomy

DEFINITION

It is a collection of fluid in the tunica vaginalis or processus vaginalis.

It may be 🏷

1- Hydrocele of the tunica vaginalis & processus vaginalis

Congenital, infantile & vaginal hydrocele (1^{ry} or 2^{ry})

2- Hydrocele of the spermatic cord

Encysted hydrocele of the cord & hydrocele of hernia sac



A- Hydrocele of tunica vaginalis

1- Congenital hydrocele

DEFINITION

Processus vaginalis remains patent & connected by a small opening to peritoneal cavity,

CLINICAL PICTURE

- Age : In infants (few months).
- Symptoms : Inguino-scrotal swelling with change in size i.e. ↓↓ in early morning & ↑↑ at end of day.
- Signs : Cystic & translucent inguino-scrotal swelling

TREATMENT

- UPPER PART : Transfixed as treatment of hernia.
- LOWER PART : Everted as treatment of hydrocele.

2- Infantile hydrocele

DEFINITION

As congenital type but no connection to peritoneal cavity

CLINICAL PICTURE

- Age : Not necessarily in infant
- **Symptoms : Inguino-scrotal** swelling with **no** change in size.
- Signs : Cystic & translucent inguino-scrotal swelling

TREATMENT

Everted as treatment of hydrocele..

3- Vaginal hydrocele

1^{ry} vaginal hydrocele

EFINITION

Collection of fluid in the tunica vaginalis only.

Unknown but may be due to irritation by repeated trauma

PATHOLOGY

Hydrocele fluid :

H₂O, salts, albumin & **fibrinogen**







CLINICAL PICTURE

- Age : Middle aged & elderly male
- Symptoms : Scrotal swelling
- **Signs :** ① Cystic & translucent scrotal swelling (you can get above it)
 - 2 Dull on percussion.
 - ③ By transillumination it is translucent.

COMPLICATIONS:

- ① Pyocele : If infection.
- ② Calcification of sac.
- ③ Hematocele : If trauma or attempts for aspiration.
- ④ Interfere for daily activity.
- ⑤ Huge expansion of the scrotum leading to indrawn of the penis which may interfere with intercourse
- **D. D** Pyocele, hematocele & chylocele.

TREATMENT

- A- Aspiration (Better avoided)
 - Indicated when an operation cannot be done e.g. old age
 - **Complicated by** hemorrhage, infection, testicular atrophy & recurrence.
- **B- Surgical treatment**

PRINCIPLES



③ Lord's operation

a. **operative** details



2^{ry} vaginal hydrocele

CAUSES 2^{ry} to 3

- Acute : Acute epididymo-orchitis & endemic funiculitis.
- Chronic:
 - ① Testis : \$ or malignant tumors.
 - ⁽²⁾ Epididymis : T.B, bilharziasis or filariasis.
 - ③ Spermatic cord : Varicocele, bilharziasis or filariasis.
 - ④ **Post operative :** After hernia operation.

TREATMENT

- Treatment of the cause





B- Hydrocele of the spermatic cord

1- Encysted hydrocele of the cord

- ⇒ It is due to persistence of the middle part of the processus vaginalis
- \Rightarrow It is **scrotal** swelling.
- ⇒ The mass separated from testis by gap (D.D SPERMATOCELE).
- ⇒ It moves side to side and not up & down.
- ⇒ The characteristic sign : Gentle traction upon the testis the swelling moves down so becomes less mobile
- ⇒ **Treatment :** Excision through an inguinal incision.

2- Hydrocele of hernia sac

- ⇒ It occurs in narrow necked sacs becomes occluded by omentum or adhesions after reduction of its contents
 → collection of serous fluid in the sac.
- ⇒ Cystic translucent inguino-scrotal swelling.
- \Rightarrow **Treatment :** Excision through an inguinal incision.

3- Hematocele



Accumulation of **blood** in the tunica vaginalis

A- Recent hematocele

- ⇒ It is due to ① Injury of blood vessels during aspiration.
 ② Trauma of the testis.
- ⇒ It is a painful, non translucent mass
- Treatment : Urgent evacuation & excision of tunica

B- Old clotted hematocele

- \Rightarrow It is due to neglected recent cases.
- It is a painful, non translucent mass + hard in consistency
 & may be complicated by testicular atrophy.
- ➡ Treatment : Early cases : Dissection of clot from testis & excision of tunica can be done.
 - late cases : Orchidectomy.

N.B: D.D of Scrotal swellings

- A- Skin : Sebaceous cyst & sqaumous cell carcinoma
- B-Tunica : Hydrocele, hematocele, pyocele & chylocele
- C-Testis: Tumors
- **D- Epididymis :** T.B





III- TESTICULAR TUMORS

INCIDENCE

- 99 % of testicular neoplasm are malignant.
- They constitute 1-2% of malignant tumors in males.

PREDISPOSING FACTORS

- The Incidence increases 15 times in undescended testis.
- Surgery for undescended testis does not prevent the susceptibility to malignancy

- Seminoma (40 %)
- Teratoma (32 %)
- Combined seminoma & teratoma (14 %)



- Interstitial cell tumor (1.5 %)
- Lymphoma (7 %)
- Other tumors (5.5 %)

	Seminoma	Teratoma
Origin	Arising from seminefrous tubules.	Arising from embryonic totipotent cells giving rise to ectoderm, mesoderm & endoderm.
Age	Older age	Younger (20 - 35 years)
Pathology - N/E :	 The enlarged testis is firm & smooth Non capsulated 	 The enlarged testis is variable consistency & irregular Non capsulated
- Cut section	 Homogenous, fibrous septa give lobulated shape. Areas of Hoe & necrosis. 	 Heterogenous with multicystic mass. Areas of Hae & necrosis.
- M/P :	 The cells : Rounded with large rounded nuclei arranged in sheets. The stroma : shows fibrous tissues infiltrated by lymphocyte 	 1- Teratoma differentiated (T.D): dermoid cyst. 2- Malignant teratoma intermediate (M.T.I) the most common. 3- Malignant teratoma anaplastica (M.T.A). 4- Malignant teratoma tranboblastica (M.T.T);
		trophoblastica (M.T.T): the most malignant

	Seminoma	Teratoma
	ETT 1 2 31 4 THE REAL PROVIDENCE	
Growth	- Slow rate	- Rapid rate
Malignancy	- Lower.	- Higher.
Spread	- Mainly (not only) lymphatic.	- Mainly (not only) blood
Irradiation	- Radio sensitive .	- Radio resistant .
Prognosis	- Relatively good .	- Bad prognosis

SPREAD

- **Direct** To the rest of testis then to the surroundings as epididymis, tunica ... etc.
- **Lymphatic** (mainly with **seminoma**).
 - To para-aortic L.Ns \rightarrow cysterna chyli \rightarrow Thoracic duct \rightarrow Virchow's gland.
- **Blood** (mainly with **teratoma**) To the lung , **b**one, liver & **b**rain.



Malignant teratoma

STAGING

- **Stage I**: Tumor in the testis only.
- **Stage II** : Tumor + involvement of L.Ns **below** the diaphragm (Para- aortic)
- Stage III : Tumor + involvement of L.Ns above the diaphragm (Virchow's)
- **Stage IV** : Distant metastasis.

CLINICAL PICTURE

A- Typical picture

- Symptoms :

- ① Painless enlargement of testis
- ② sense of heaviness.
- Signs :
 - ① The testis : Enlarged with slippery edge & early loss of testicular sensation.
 - ⁽²⁾ Abdominal examination for para-aortic L.Ns.
 - ③ Lt. supra-clavicular region for Virchow's gland.

B- Metastatic picture 1st presentation, i.e. Occult carcinoma

- Seminoma → Epigastric mass i.e. para-aortic L.Ns.
- **Teratoma** \rightarrow Hemoptsis, dyspnea ... etc. i.e. lung metastasis.

C- Atypical picture

- Some cases may simulate acute epididymo-orchitis. (Acute pain with swelling may be due to hemorrhage).
- ^② The Hurricane type : Fatal in few weeks.

D.**D** (Loss of testicular sensation)

- ① Testicular tumors.
- ^② Syphilitic infection i.e. Gumma of testis.
- ③ Old clotted hematocele.

INVESTIGATIONS

A- Laboratory

Tumor markers

- 1- Beta HCG
- 2- alpha feto-protein (Elevated in Teratoma & NEVER in seminoma)

B- Radiological

- 1- Plain x-ray (chest) for metastasis.
- 2- Scrotal U/S (diagnostic)

C-Instrumental

Testicular biopsy

The scrotum should never be opened to get a needle biopsy to prevent opening of alternative way for lymphatic spread.

So An inguinal incision is made then a vascular clamp is applied to the cord at the deep ring & then the testicle is delivered.





TREATMENT

A- Retrograde high simple orchidectomy

- Through inguinal incision the inguinal canal is opened then the spermatic cord is isolated at the internal ring.
- Finally the testis is excised.

B- Further treatment

1- SEMINOMA :

- Stage I & II : Radiotherapy to para-aortic L.Ns.
- Stage III : Radiotherapy extends to Lt. supra-clavicular L.Ns.
- Stage IV : Chemotherapy.

2- TERATOMA :

- Stage I : Follow up by tumor markers.
- Stage II, III & IV : Chemotherapy.

PROGNOSIS

- SEMINOMA : Relatively good.
- **TERATOMA** : Bad prognosis.

IV- TORSION OF THE TESTIS

DEFINITION

It means torsion of the testis & epididymis. around the axis of the spermatic cord.

PREDISPOSING FACTORS

① Imperfect descent of the testis (incomplete or ectopic)

Fig 2

- ^② Long mesorchium (see fig .1).
- 3 Capacious tunica vaginalis.
- ④ Polar anteversion of the Testis (see fig .2).
- (S Spirally arranged cremastric muscle (see fig .3).



Fig 3

EXCITING CAUSES

Minor trauma or straining at defecation leads to twist of the spermatic cord.

PATHOLOGY

- TESTIS : Rotates from outside inwards
- SPERMATIC CORD : shows the twists, if torsion persists, the blood vessels are thrombosed & gangrene occurs within 8 -12 hours
- **TUNICA :** Small 2^{ry} hydrocele or hematocele.
- SCROTUM : Red & edematous.

CLINICAL PICTURE



- ① Sudden severe agonizing pain in the groin & lower abdomen.
- ② It may be presented by neurogenic shock + vomiting

- SIGNS :

- ① The scrotum is swollen & the overlying skin is edematous & red.
- ^② The testis is higher than normal & sometimes the twists are felt in the cord.

D . D (1)	TORSION OF SPERMATIC CORD	ACUTE EPIDIDYMO-ORCHITIS	
Age	Adolescents or children	Adults or elderly	
HISTORY	Mild trauma	U.T.I symptoms	
TEMPERATURE	Normal	Elevated	
ELEVATION OF	Dose not relieve pain	Relieve pain	
SCROTUM			
URINE ANALYSIS	Free	May show pus cells	
DOPPLER & DUPLEX	LER & DUPLEX Obstructed testicular vessels Patent testicular ve		



D . D (2)	TORSION OF	STRANGULATED
	UNDESCENDED TESTIS	INGUINAL HERNIA
TENSE & TENDER	Absent	Present
EMPTY SCROTUM	Present	Absent

INVESTIGATION

- DOPPLER & DUPLEX SCAN : To detect the thrombosed vessels.

TREATMENT (Urgent)

1- VIABLE TESTIS :

Untwist the cord & fix the testis to the scrotum to prevent recurrence then eversion of tunica

2- GANGRENOUS TESTIS :

Orchidectomy above the twist.



V- INFLAMMATIONS OF THE TESTIS

& SPERMATIC CORD

1- Acute inflammation

Acute Epididymo- orchitis

AETIOLOGY

- Organism : E coli, staphylococci, streptococci.... etc.
- Source of infection : urethra, prostate & seminal vesicle.
- Routes of Infection :
 - ① *Blood borne* infection.
 - ② Descending via lumen of vas

2^{ry} to urethritis, prostitis ... etc.

CLINICAL PICTURE

• SYMPTOMS :

Acute severe inguino-scrotal pain.

• SIGNS :

- General : Fever, Headache, Malaise & Anorexia.
- Local : The epididymis and testis are swollen, hot & tender with edematous scrotal skin with 2^{ry} hydrocele.

INVESTIGATION

• URINE ANALYSIS may show pus cells

TREATMENT

- General : Rest in bed with antibiotics after culture & sensitivity test.
- Local : Incision & drainage of pus if present.



2- Chronic inflammation

	• BILHARZIASIS	9 FILARIASIS	
AETIOLOGY	① Hematobium	It is usually follow	① 2 ^{ry} urinary T.B
	worms	acute funiculitis.	② Sometimes blood
	⁽²⁾ Mansoni worms		borne
TYPES	1) Granular form	1) Nodule type	
	② Nodule form	② Diffuse type	
C/P	③ Massive form		
History	Bilharziasis.	Filariasis.	Tuberculosis.
Site	Lower part of cord	Any part of cord	Tail of epididymis.
Epididymis	Affected if massive	Not felt if chylocele.	Early tender, hard mobile mass
			Late : Cold abscess which may burst → T.B sinus at posterior wall of scrotum.
Cord & Vas	Nodular vas	Matted cord	Beaded vas.
Tunica	2 ^{ry} hydrocele	Chylocele	2 ^{ry} hydrocele.
Scrotum	Normal	Thickened &	Ulcerate posteriorly
D/D	Dí offacto prostato	Free	T D offecte prestate
P/K	& seminal vesicle	Fiee	& seminal vesicle
INVESTIGATION			
Urine	+ve ova	Free	Free
Blood	Free	Night film +ve	Free
Tuberculin	Free	Free	+ve Test
TREATMENT			
General	Anti-B drugs.	Anti-filarial drugs	Anti-T.B drugs.
Local	Excision of mass	Excision of mass	Epididymo-vasectomy

O SYPHILIS

• SYPHILITIC ORCHITIS may be P>

① Diffuse interstitial fibrosis

- ② Bilateral orchitis : Usually congenital.
- ③ **Solitary gumma of testis :** Painless mass with loss of testicular sensation, later on ulcerate anteriorly.

VI- CYST OF THE EPIDIDYMIS

Spermatocele

DEFINITION

It is a retention cyst in head of epididymis 2^{ry} to obstruction of vas.

PATHOLOGY

The cyst contains white fluid in which living & dead sperms can be identified.

CLINICAL PICTURE

• SYMPTOMS :

Asymptomatic as it is small or less frequently the patient imagine that he has **3** testicles.

• SIGNS :

Globular transopaque smooth swelling lying just above & behind the upper pole of testis with (**no** gap) between them, i.e. DD encysted hydrocele of cord.

TREATMENT

ASPIRATION OF EXCISION

VII- IDIOPATHIC GANGRENE OF THE SCROTUM

Fournier's gangrene

DEFINITION

Type of infective gangrene caused by hemolytic streptococci + E-coli.

PATHOLOGY

Starts as inflammatory skin condition which rapidly progress to gangrene especially in diabetics.

CLINICAL PICTURE

The whole skin of the scrotum may slough (from inflammatory thrombosis of the vessels).

TREATMENT

ANTIBIOTICS + REPEATED DRESSINGS until slough separates and early **SKIN GRAFTING**.





ORTHOPEDICS



Principles of Orthopedics

ORTHOPEDICS

ORTHOPEDICS:

Can be divided into \mathfrak{P}

- A Traumatology (fracture & dislocation)
- B Bone, joint diseases & deformities.

TRAUMATOLOGY

DEFINITION

A- Fracture Loss of bone continuity

B- Dislocation Loss of contact between 2 articular surfaces.

AETIOLOGY

A- Traumatic fracture

DIRECT TRAUMA

e.g. Direct blow or car accident

- Fracture one bone : The bone breaks transversely
- Fracture both bone : The both bones breaks at same level.

INDIRECT TRAUMA

e.g. Fall on the out-stretched hand or fall from a height.

- Fracture one bone : The bone breaks obliquely
- Fracture both bone : The both bones breaks at different level.

AVULSION TRAUMA

Due to severe muscle contraction, e.g. fracture of patella.

B- Pathological fracture

DEFINITION

Multiple fractures due to minor & recurrent trauma at a pathological bone due to generalized or localized bone disease.

AETIOLOGY

> **Congenital :** Osteitis fragilis (**** osteoid tissue) & congenital cysts.

> Inflammatory :

- ① Chronic osteomyelitis.
- ^② T.B osteomyelitis.
- 3 Gumma in the bone.
- Endocrinal :
 - ① Hyperparathyroidism (osteitis fibrosa cystica).
 - ^② Cushing syndrome.
 - ③ Menopausal causes.
- > Rickets : Due to vitamin D deficiency or renal rickets.
- > **Neoplastic :** 1^{ry} tumor or metastasis.


CLASSIFICATIONS

A- The fractures are either complete or incomplete

- Complete : Total loss of bone continuity
- **Incomplete :** The cortex is broken from one side as fissure fracture or green stick fracture.
- B- Fractures are either simple or compound
 - Simple fracture without an external skin wound.
 - Compound fracture with an external skin wound. which may be ²
 - ① Compound from without :
 - i.e. the causative trauma leads to skin wounds & fractures.
- ② Compound from within :
 - i.e. the fractured end of bone is the cause of skin wound.
- ③ A break in the skin surface : i.e. due to skin death from ischemia.

C- Classification according to the shape of fractures

- Transverse fracture
- Oblique fracture
- Spiral fracture

- Greenstick fracture
- Comminuted fracture
- Wedge









Grossly comminuted fracture

Greenstick fracture

CLINICAL PICTURE

- 1- History of trauma.
- 2- Ecchymosis.
- 3- Loss of function.
- 4- Pain due to friction between bone ends.
- 5- Swelling due to the fracture hematoma & oedema.
- 6- Deformity due to displacement of the fragment by action of muscle.



N.B.: Crepitus :

- It is a definite sign of fracture, but don't search for it as this may induce more trauma
- It is absent in cases with incomplete or impacted fracture.
- 8- Tenderness maximum at site of fracture.

DIAGNOSIS X-ray

- > It must show the bone with joint above & joint below.
- It must done 3 times :
 - At time of fracture (diagnostic).
 - After fixation to ensure of good reduction.
 - Before removal of plaster to ensure healing.
- It must be 2 views :
 - Antero-posterior view.
 - Lateral view for angulation & over-riding.





1- LATERAL DISPLACEMENT : The distal segment deviates to one side.

2- ANGULATION :







COMPLICATIONS OF FRACTURES

A- General complications

Mainly with fracture (pelvis, femur & spine).

- 1- Shock : Neurogenic & hypovolaemic
- 2- Hemorrhage : External or internal.

3- Fat embolism :

Especially fracture (femur)

4- Crush syndrome leads to acute renal failure.

5- Paralytic ileus & acute gastric dilatation

Especially fracture (pelvis & spine) due to P.

- 1- Retro-peritoneal hematoma.
- 2- Sympathetic over-stimulation.
- 6- Tetanus with compound fracture.

7- Complications of prolonged recumbancy

- ① Bed sores.
- 2 D.V.T.
- ③ Respiratory complications.
- ④ Pulmonary embolism.
- © Urinary calculi.
- 6 Constipation.
- ⑦ Psychological complications.

B-Local complications

1- Skin injury with compound fracture.

2- Muscle & tendon :

- Tear or myositis ossificans (see below)

3- Vascular injury :

- Spasm or contusion or division \rightarrow Acute ischemia.
- Volkmann's ischemic contracture (see below)

4- Nerve injuries.

5- Bone complications :

- Mal, delayed or non union (see below).

- Avascular necrosis .

Interruption of the blood supply of a bone fragment leading to its necrosis e.g. fracture neck femur.

6- Joint injury :

e.g. Dislocation. sublaxation, sprain, stiffness, effusion, hemo-arthrosis & osteo-arthritis.

7- Visceral injury :

e.g. Rupture bladder or urethra with fracture pelvis.

8- Sudek's atrophy (see below).



- **1- Myositis ossificans**
- 2- Sudek's atrophy
- **3- Volkmann's ischemic contracture**
- 4- Mal, delayed or non union

1- MYOSITIS OSSIFICATIONS

DEFINITION

Heterotropic bone formation in the fleshy part of muscle.

INCIDENCE

It is most often seen after supra-condylar fracture (humerus & femur)



PATHOGENESIS

The hematoma in the injured muscles communicating with the fracture, in which the periosteum has been avulsed so the periosteum migrates from the bone to the muscle hematoma, then the periosteal cells proliferate within the hematoma & ossify.

CLINICAL PICTURE

The condition may be suggested by a failure of the range of movement of the joint e.g. elbow joint

TREATMENT

A- Prophylactic treatment :

Early reduction of fracture & avoid massage or passive exercises.

B- If ossification develops :

Prolong the period of immobilization. This gives the chance for the body to remove it almost completely.

C- If residual mass after prolonged immobilization :

Can be removed surgically

2- SUDEK'S ATROPHY

DEFINITION

It is a syndrome in which there is osteoporosis, swelling of the soft tissue, vascular stasis, pain & joint stiffness complicating a fracture.

INCIDENCE

It is most often seen after **Colle's** fracture





AETIOLOGY Unknown

TREATMENT

Physiotherapy. analgesics, splinting & sympathectomy may be indicated

3- VOLKMANN'S ISCHEMIC CONTRACTURE

[Contracture = Permanent shortening of the muscle due to fibrosis]

DEFINITION

Massive infarction of the muscles of forearm (flexor compartment) in case of supra-condylar fracture humerus from injury of brachial artery.

N.B.: Similar condition can occur in leg flexors after popliteal artery injury with supra-condylar fracture femur.

INCIDENCE

It is most often seen after supra-condylar fracture (humerus & femur)

CLINICAL PICTURE

Early Picture of acute ischemia of forearm & hand (6Ps)

Pain, Pallor, Paralysis, Paraesthesia, Pulselessness & Perishing coldness.

Later on

① Deformity : Flexion of wrist & inter-phalangeal joints & extension of metacarpophalangeal joints.

- ② Atrophy of forearm muscles.
- ③ Ischemic neuritis & trophic changes at distribution of median nerve.

N.B. : Special test :

The flexors of fingers are short so when the wrist is flexed, the fingers can be passively extended

TREATMENT

A- Prophylactic ttt

Fracture around elbow must be reduced early to relieve any pressure on the brachial artery. but if signs of acute ischemia occurs do exploration + repair of brachial artery injury

B- In established cases

- Early cases :

Do passive traction of the shortened muscles in the hyper-extended position by plaster cast.

- Late cases : [Muscle sliding operation]

Sliding the origin of flexor muscles from the medial epicondyle downwards to the ulna. So extra-length is given to the shortened muscles correcting the shape but not the function of the hand.





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I- MAL, DELAYED & NON UNION



1- STAGE OF HEMATOMA :

A hematoma forms between & around the fracture surfaces.

2-STAGE OF GRANULATION TISSUE :

The hematoma becomes invaded by fine capillaries & fibroblasts forming granulation tissue.

3- STAGES OF 1^{RY} CALLUS FORMATION :

Calcification & invasion by osteoblasts lead to osteoid tissue formation. The 1^{ry} callus is found as \Rightarrow

- ⇒ Outer callus.
- \Rightarrow **Inner** callus, obliterating the medulla.
- \Rightarrow **Intermediate** callus (the most important).
- **4- STAGE OF CONSOLIDATION : 1**^{ry} callus is transformed into bone.
- 5- STAGE OF REMODELING : Absorption of outer & inner cells.

FACTORS AFFECTING UNION OF FRACTURE

A- General (Age of patient)

- ① Children have rapid healing.
- 2 Elderly have retarded healing.

B- Local

① Vascularity of fragments :

e.g. Intra-capsular fracture of neck femur with injury of the blood supply leads to avascular necrosis of femoral head.

- ② Good immobilization or not.
- 3 Position of fragments.
- ④ Aseptic fracture leads to good union.
- S Local bone health i.e. no pathological fractures



TYPES

A- Mal-union

DEFINITION It means union with some deformity i.e. **bad** position.

CAUSES Improper reduction or **bad** immobilization.

CLINICAL PICTURE No pain is associated.

X-RAY Union in **bad** position.

TREATMENT Corrective osteotomy.

B- Delayed union & non union



	DELAYED UNION	Non UNION	
DEFINITION	It means union at a slow rate with good position.	It means that fracture did not & will not unite.	
CAUSES A- General	Senility, scurvy, debilitating disease, rickets, osteomalacia		
B- Local	 Impairment of blood supply of one or more fragments. Inadequate Immobilization. Interposition of soft tissue between fragments. Infection. Local bone disease. 		
C/P	There is still abnormal movement & tenderness at the site of fracture.		
X-RAY	Bone ends are still raw & gap is filled with faint bone	Bone ends are sclerosed & gap is seen with no bone	
TREATMENT	Prolong the immobilization, e.g. # Clavicle & Colle's #	Internal fixation & application of autogenous bone graft e.g. Iliac crest (bone chips)	

Treatment of fractures

A- General management (1st AID TRETMENT)

- 1- Sterile dressing over the wound.
- 2- Anti-shock measures & analgesics.
- 3- Immobilize the fractured part without reduction.
- 4- Sedation for the patient e.g. Morphia.
- 5- Full examination to exclude other injuries.

- 1-Reduction

B- Local management (Definitive TTT)

– 2- Fixation

_ 3-Rehabilitation & physiotherapy

I. REDUCTION

(Aiming at restoring the continuity of the fracture)

A- Closed reduction

- By traction, counter-traction & manipulation until reaching the anatomical position (under anesthesia).
- Confirm the position clinically & by x-ray.

B- Open Reduction (At operation)

- By exposure of fracture site & apposition of the fractured segments surgically.
- Indicated if [™]
 - ① Failure of closed method.
 - ② Inter-position of soft tissues between the fracture wound.
 - ③ Intra-articular fractures.

④ When internal fixation is indicated ಾ

- a- Associated soft tissue injury.
- b- Pathological fractures
- c- Fracture dislocation.
- d- Multiple fractures.
- e- Unstable fractures.



(Aiming at maintaining the reduced position & preventing displacement) A- External fixation

TYPES



- 1- Cast : Circumferential plaster in a limb (plaster cast of paris)
- 2- Slab : Plaster put from one side only.
- 3- Shoulder spica : Cast including trunk & upper Limb.
- 4- Hip spica : Cast including trunk & lower limb.
- 5- **Jacket** : Plaster around trunk without limb.

COMPLICATIONS OF CAST

- 1- If tight leads to compression on vessels e.g. Volkmann's contractures.
- 2- If loose leads to mal-union or delayed union
- 3- Pressure on muscles leads to atrophy or joint stiffness.

B-Internal fixation

TYPES



- 1- Wires : By stainless stee! wire e.g. fracture olecranon or patella.
- 2- Screw : e.g. oblique fracture of the tibia
- 3- Plate & screws : e.g. any transverse fracture.
- 4- Nail (intra-medullary) : e.g. shaft of femur.
- 5- Bone graft (Autogenous) as P>
 - a. upper 2/3 of fibula
 - b. Ant. border of tibia.
 - c. Iliac crest (bone chips).
 - d. Rib (ideal for the mandible)

COMPLICATIONS

- 1- Introduction of infection.
- 2- Interfere with union if too much periosteum is stripped.
- 3- Mechanical block of near by joint.
- 4- Improper fixation of the fracture.

C- Fixation by continuous traction

1- SKIN TRACTION

e.g. Thomas splint

- Adhesive tapes are stuck on either side of the limb and held by bandage & cord is tied at the end of the tape for traction.

2- SKELETAL TRACTION

e.g. Bohler frame

- By a special pin introduced transversely at upper end of tibia.

D- External skeletal fixation

- It is indicated with severe compound fracture especially tibia & femur.
- The Idea to transfix the major proximal & distal fragment with multiple pins to which is attached a frame device outside the body.







III. REHABILITATION

(Aiming at preserving & restoring the function of injured part)

1- Static (isometric) exercises

They are done for muscles inside the cast.

2- Active exercises

They are done for muscles **outside** the cast i.e. after removal of cast

.....

COMPOUND FRACTURE

DEFINITION Fracture with skin loss.

TYPES which may be ጓ

① Compound from without :

i.e. the causative trauma leads to skin wounds & fractures.

② Compound from within :

i.e. the fractured end of bone is the cause of skin wound.

③ A break in the skin surface : i.e. due to skin death from ischemia.

TREATMENT

A- General management (1st AID TRETMENT)

- 1- Sterile dressing over the wound.
- 2- Anti-shock measures & analgesics.
- 3- Immobilize the fractured part without reduction.
- 4- Sedation for the patient e.g. Morphia.
- 5- Full examination to exclude other injuries.

B- Local management (DEFINITIVE TTT)

1- If the wound clean (6 – 8) hours :

Excision of the wound + closure of skin + closed reduction & external fixation

2- If the wound potentially contaminated (8 – 24) hours : Depridement of the wound + NO closure of skin + external skeletal fixator

N.B: Winnet Orr Technique It is a window in cast for daily dressing

3- Post-operative treatment

Limb elevation + Antibiotics + Analgesic

Injuries of Upper limb

INJURIES OF UPPER LIMB

I- FRACTURE CLAVICLE

1- Fracture middle 1/3 80 %

AETIOLOGY (Trauma)

Direct Like hit by a stick.

Indirect Fall on out-stretched hand.

N.B.: The commonest site for fracture

is middle 1/3 because 玲

- ① It is the site of meeting of 2 curves.
- ② It is the thinnest part of the bone.
- ③ The site of insertion of subclavius muscle.
- ④ The site of entrance of nutrient artery.

In children the fracture is often the greenstick variety.

CLINICAL PICTURE & DIAGNOSIS As general +

- Loss of function :

The patient comes carrying the injured limb by the healthy one like **a mother suckling her baby**.

- DEFORMITY :

The **medial end** is pulled upwards by the sternomastoid, while the **lateral end** fall downwards by its weight & pulled forwards by the pectoralis major muscle

COMPLICATIONS (Local)

- **1- SKIN INJURY** with compound fracture.
- 2- MUSCLE & TENDON : Tear of subclavius muscle.
- 3- VASCULAR INJURY of subclavian vessels.
- 4- NERVE INJURY of Brachial plexus.
- 5- BONE COMPLICATIONS : Mal-union is very common & non-union is rare.
- 6- JOINT INJURY : Stiffness of shoulder joint with elderly.
- **7- VISCERAL INJURY :** To the dome of the pleura & apex of the lung leading to pneumothorax.

TREATMENT

No attempt should be made to reduce the fracture because it is not possible hold the reduction even if it is achieved.









Most surgeon depend only on arm to neck sling for 3 weeks + analgesics.

N.B. : Open reduction is indicated only with Unstable fracture or if vascular, nervous or pleural complications.



2- Fracture outer 1/3 15 %

- Usually no displacement occurs because both fragments are attached to the scapula by ligaments.
- > If there is **no** displacement, **no** treatment is required but analgesics



AETIOLOGY (Trauma)

Direct

- ① Fall from a height with a limb holding a bar.
- ^② Forcible extension of arm.
- ③ Forcible external rotation of arm.

Indirect

Fall on out-stretched hand.

N.B.: Causes of instability of the shoulder joint [™]

- ① Big head of humerus.
- ^② Shallow glenoid cavity.
- ③ Wide range of movement.
- ④ Lax capsule especially below.
- S Lack of muscle support below.

CLINICAL PICTURE As general +

- LOSS OF FUNCTION :

The shoulder cannot be moved & the arm is held in a position of slight abduction.

- SWELLING :

The head is felt in abnormal position.

- ① Sub-coracoid (the commonest).
 - ② Sub-glenoid.
- ③ Sub-clavicular.

- DEFORMITY :

Flattening of the shoulder contour as the head of humerus is lost with slight **abduction**.







DIAGNOSIS (X-ray)

Antero-posterior view is diagnostic

COMPLICATIONS (Local)

1- SKIN INJURY with associated compound fracture.

2- MUSCLE & TENDON : Avulsion of supra-spinatus tendon. so the patient is unable to initiate abduction.

3- VASCULAR INJURY of **axillary** vessels.

4- NERVE INJURY of brachial plexus.

5- BONE COMPLICATIONS : Fracture of head or neck of the humerus.

6- JOINT INJURY : RECURRENCE

- It is due to detachment of the labrum glenoidal & the anterior capsule from the anterior margin of the glenoid. A pouch is formed into which the humeral head slips easily
- ➡ Clinically : Redislocation occurs with relatively minor every day actions such as combing the hair or during swimming.
 - But reduction is equally easy & usually the patient can reduce it by himself.

⇒ Treatment :

A. Putti-Platt operation :

The idea is to limit external rotation of the shoulder by shortening of the subscapularis by overlapping.

B. BanKart operation : (The better)

The original lesion in the capsule or labrum glenoidal is repaired.

TREATMENT

(Kocher's operation)

- **Under general anesthesia.** 1st. externally rotates the arm to relax the subscapularis while pulling down on the arm to dislodge the head
- **Then** the limb is adducted & internally rotated till the hand of the patient touches the healthy shoulder
- Finally : Fixation in arm to chest bandage for 3 weeks.

2- Posterior dislocation

- ⇒ This is **not** common.
- ⇒ It is usually caused by **forced internal rotation** of abducted arm.
- \Rightarrow It always be suspected after epileptic fit or an exposure to electric shock.





III. FRACTURE HUMERUS

1- Fractures of the proximal humerus

AETIOLOGY (Trauma)

Direct Less common.

Indirect Fall on out-stretched hand.

CLASSIFICATION (Neer's 4 segments)

Fractures can occur between

- ① Articular segment of fractures.
- ② Greater tuberosity.
- ③ Lesser tuberosity.
- ④ Surgical neck.

Identify each one according to

- ① One part fracture → No displacement
- ② **Two** parts fracture \rightarrow **One** segment is displaced.
- ③ **Three** parts fracture \rightarrow **Two** segments is displaced.
- $\textcircled{$ Four parts fracture \rightarrow Three segments is displaced.

CLINICAL PICTURE & DIAGNOSIS As general

COMPLICATIONS (Local)

As general + Circumflex nerve injury \rightarrow paralysis of deltoid muscle .

TREATMENT

1- One part fractures :

- External immobilization using a sling until pain subsided.

2- Two parts fractures :

- Fractures of greater tuberosity : Open reduction & internal fixation using screw or wire
- *Fractures of lesser tuberosity :* Just immobilization using **arm to neck sling** for **3** weeks
- Fractures of surgical neck : Closed reduction & arm to neck sling for 3 weeks

3- Three parts fractures :

- Open reduction & internal fixation

4- Four parts fractures :

- Usually associated with avascular necrosis of the humeral head & best treated by **prosthetic** replacement.





2- Fracture of the shaft of humerus



- Distal segment : Adducted & pulled upwards by coraco-brachialis.

COMPLICATIONS (Local) As general +

- Radial nerve injury.

- Non union because fracture in middle 1/3 leads to injury of nutrient artery.



TREATMENT

Closed reduction + external fixation

- Reduction : with gentle traction on the elbow.
- Fixation : U- shaped plaster slab for 3 weeks to be changed by collar & cuff sling for 3 weeks.

Open reduction + internal fixation by plate & screws











3- Supra-condylar fracture humerus

AETIOLOGY (Trauma) frequent in CHILDREN

Direct very rare.

Indirect Fall on out stretched hand.

CLINICAL PICTURE & DIAGNOSIS As general +

- DEFORMITY: It may be P

EXTENSION TYPE (99%)	FLEXION TYPE (1%)	
Displaced backwards & upwards, i.e. extended in relation to proximal fragment.	Displaced forwards & upwards i.e. Flexed in relation to proximal segment.	

D.D Posterior dislocation of the elbow joint \mathfrak{P}

	SUPRA-CONDYLAR Fracture	POSTERIOR DISLOCATION
- Age	Commonly in children .	Commonly in adults
- Anterior palpation	Lower border of upper fragment is felt above the elbow crease.	Lower border of the humerus is felt, at the level of the elbow crease.
- Posterior palpation	Upper border of lower fragment is felt sharp	The olecranon is felt
- Measurements: tip of acromion to lateral epicondyle	Short	Normal

COMPLICATIONS (Local)

1- SKIN INJURY with associated compound fracture.

2- MUSCLES : Myositis ossificans at brachialis muscle.

3- NERVE INJURY : Median, radial or ulnar nerve injuries.

4- VASCULAR INJURIES : Volkmann's ischemic contracture.



5- JOINT : Stiffness of the elbow.

6- BONE : Malunion from failure to reduce the fracture properly.

N.B. : Cubitus varus or valgus :

It means loss of carrying angle \rightarrow delayed ulnar neuritis

TREATMENT

Closed reduction + external fixation + after care

- Reduction :

Urgent to relieve brachial vessels from any compression (under general anesthesia) the elbow is extended while the lower fragment is guided **forwards** in extension type or **backwards** in flexion type.

Then the carrying angle is checked with elbow fully extended & the forearm fully supinated by comparison with the angle of normal side.

Then the elbow slowly flexed until 90° is reached.

Throughout this maneuver : The radial pulse is felt

- Fixation :

Above elbow posterior slab for 3 weeks then a collar & cuff is added.

N.B.: Some surgeons prefer to fix this fracture with the elbow in extension

> ① To avoid compression of the vessels & elbow stiffness.



^② To prevent cubitus varus deformity

- After care

Hospitalization & monitoring of radial pulse for 48 hours.

Open reduction + internal fixation by wires

Indicated when the closed method fails to obtain satisfactory reduction

IV- ELBOW JOINT DISLOCATION

	POSTERIOR	Anterior	
	DISLOCATION	DISLOCATION	
	Coronoid!	Olecranon	
	Fracture of coronoid process of ulna is associated	Fracture of olecranon process of ulna is associated	
AETIOLOGY	(Trauma) frequent in ADULT		
	Fall on outstretched hand while the limb is extended.	Fall on tip of elbow,	
	RE & DIAGNOSIS As general +		
- DEFOR The the I	Olecranon is felt (abnormally) po numeral condyles with post. dislo	sterior to ocation	
N.B.: Di re (2	sturbance in the triangular lation of 3 bony land-marks. Epicondyles & 1 olecranon).		
COMPLICATIONS	As general +		
TREATMENT			
	leasting a sector shift of the		

Closed reduction + external fixation

- **Reduction :** Under general anesthesia traction is applied in the long axis of the slightly flexed ulna.
- Fixation : Above elbow posterior slab for 3 weeks to allow for healing of the capsule & the ligaments

Open reduction + internal fixation Rarely done

V- FRACTURE OF THE FOREARM

- **1- Fractures of the head of the radius**
- 2- Fractures of the shafts of radius & ulna
- **3- Monteggia fracture-dislocation**
- 4- Galeazzi fracture-dislocation
- 5- Colle's' fracture

1- Fractures of the head of the radius

AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on me out stretched hand.



CLINICAL PICTURE & DIAGNOSIS As general +

Suppination, pronation & elbow movement is limited.

TREATMENT

Fissure or sector A sling till pain decreases

Comminuted Excision of head of radius.

2- Monteggia fracture

⇒ It consists of fracture of the upper 1/3 ulna & dislocation of superior radio-ulnar joint.





Fissure Sector Comminuted

⇒ It consists of fracture of the lower 1/3 radius
 & dislocation of inferior radio-ulnar joint

4- Fracture of shaft of radius & ulna

AETIOLOGY (Trauma)

- Fracture one bone : Direct trauma only.
- Fracture both bones :
 - **Direct** : Blow will break the bones at **same** level.
 - Indirect : Results in oblique fractures at different level -

CLINICAL PICTURE & DIAGNOSIS As general

COMPLICATIONS As general +

Cross union (between radius & ulna) if fracture at same level

TREATMENT

A- Undisplaced fractures Above elbow cast 6 weeks.

B- Displaced fractures

Opened reduction + internal fixation by **plate** & **screws** →









5- Colle's fracture

DEFINITION



TYPE OF PATIENT

Old female due to post-menopausal osteoporosis.

AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on me out stretched hand.

N.B.: Smith's fracture (Reversed colle's)

- This is the reverse of colle's fracture.
- It is due to fall on the dorsum of the wrist.

CLINICAL PICTURE As general +







The distal segment displaced upwards, backwards & laterally. The fracture is commonly comminuted & impacted.

DIAGNOSIS (X-ray) Antero-posterior & lateral views is diagnostic





COMPLICATIONS (Local)

- 1- SKIN INJURY with associated compound fracture.
- 2- MUSCLE & TENDON : Tear of extensor pollicis longus muscle.
- 3- VASCULAR INJURY of radial or ulnar artery.
- 4- NERVE INJURY : Median nerve injury or carpal tunnel syndrome which is a late complication & treated by surgical division of flexor retinaculum
- 5- BONE COMPLICATIONS : Mal-union because of displacement inside the plaster.
- 6- JOINT INJURY : Stiffness of wrist & fingers.
- 7- Sudek's atrophy (See page 98).

N.B: Made-lung deformity

- It occurs in **young patient** where there is arrest of growth of the radius.
- The wrist & hand will deviate to the radial side.
- Excision of lower end of ulna is needed.



TREATMENT

Closed reduction + external fixation + after care

- Reduction : Under general anesthesia by 3 hand grips method :
 - 1st grip: to correct upwards displacement. by Traction on thumb & finger downwards & counter-traction on forearm.
 - 2nd grip: To correct backwards displacement. by pushing lower fragments forwards & counter-traction on forearm .
 - 3rd grip: To correct lateral displacement. by pushing lower fragments medially & counter-traction on forearm .
- Fixation : Below elbow plaster cast for 6 weeks.
- After care : The fingers should be actively mobilized & elevation of arm above head several times to prevent joint stiffness.



Scaphoid fracture

VI- FRACTURE OF THE HAND

.....

Fracture scaphoid

AETIOLOGY (Trauma)

Direct very rare.

Indirect Fall on me out stretched hand.

CLINICAL PICTURE & DIAGNOSIS As general +

Tenderness at anatomical (**snuff box**). Usually misdiagnosed as sprain wrist.

COMPLICATIONS As general +

- BONE :

- ① Avascular necrosis.
- ② Non-union

because of injury of its blood supply.

TREATMENT

A- If early

The wrist is fixed in **below elbow cast** including the thumb for 6 weeks

B- If late & sclerosed bone

Bone graft between 2 fragments



Rádius

Ulna

Injuries of Pelvis & lower limb

INJURIES OF PELVIS & LOWER LIMB

I- FRACTURE PELVIS

AETIOLOGY (**Trauma**)



posterior segments :

1- HINGE SUBLAXATION

 Disruption of the symphysis pubis & disruption of one of sacro-iliac joint (open book fracture)

2- VERTICAL SHEAR FRACTURE

 Fracture of both rami at the front & fracture of the ileum posteriorly.

CLINICAL PICTURE & DIAGNOSIS As general +

- LOSS OF FUNCTION :

The patient cannot stand or lifting his legs, but passive movement at the hip can be elicited by the surgeon.

- DEFORMITY :

The leg may be externally rotated

COMPLICATIONS

A- General As GENERAL

B- Local

- 1- SKIN INJURY with associated compound fracture.
- 2- MUSCLE & TENDON : Tear of corresponding muscles.
- 3- VASCULAR INJURY of pelvic vessels
- 4- NERVE INJURY : Sciatic nerve injury
- **5- BONE COMPLICATIONS : Mal**-union causing no significant problems except in female (caesarean section may be required for delivery)
- 6- JOINT INJURY : Stiffness & 2ry osteoarthrosis
- 7- VISCERAL INJURIES : As urethra, bladder, rectum, vagina ... etc.

TREATMENT

A- Correction of shock & treatment of visceral injury have a priority over treatment of fracture pelvis.

B- Treatment of fracture

- **1- FRACTURES OUTSIDE THE PELVIC RING**
- **2- SINGLE FRACTURES OF THE PELVIC RING**
- **3- TETRARAMIC FRACTURE :** Uncomplicated fracture

4- HINGE SUBLAXATION :

Open book fracture 1- Closed reduction by a pelvic sling or 2- Open reduction & internal fixation using a plate & screws

5- VERTICAL SHEAR FRACTURE :

- Skeletal traction e.g. Bohler frame
- By a special pin introduced transversely at upper end of tibia.



Require bed rest for 6 weeks





5- BONE COMPLICATIONS : Fracture of posterior lip of acetabulum.

II- HIP JOINT DISLOCATION

1- Posterior dislocation

AETIOLOGY (**Trauma**)

Direct Car accident while patient is in the front seat.

Indirect Fall of heavy objects on the pelvis of a person leaning forwards with the legs adducted e.g. (mine workers).

N.B.: CAUSES OF STABILITY OF THE HIP JOINT :

① The depth of acetabular cavity.

⁽²⁾ The strong support by its ligament & muscles.

CLINICAL PICTURE As general +

- Loss of function :

Movement of the hip is painful & limited, there is shortening of the affected limb.

- SWELLING :

The head is felt on abnormal position (gluteal region)

- ① Dorsal dislocation
- Iliac dislocation.
- 3 Sciatic dislocation, i.e. in sciatic notch

- DEFORMITY :

The hip is in the position of flexion, adduction & internal rotation

DIAGNOSIS (X-ray)

RADIOLOGICAL FINDINGS :

① The femoral head lies outside the acetabulum.

② The Shenton's line is interrupted.

It is a curve formed by lower margin of the superior pubic ramus & the lower border of femoral neck.

③ Any associated fractures.

COMPLICATIONS

A- General As GENERAL

B-Local

1- SKIN INJURY with associated compound fracture.

- 2- MUSCLE & TENDON : Tear of corresponding muscles.
- 3- VASCULAR INJURY : Avascular necrosis of femoral head.
- 4- NERVE INJURY : Sciatic nerve injury















Closed reduction + external fixation

- Reduction : Under general anesthesia

The hip & knee are flexed then do external rotation & abduction. So reduce the head to its socket

- Fixation Skin traction on Thomas splint for 6 weeks





AETIOLOGY (Trauma)

It is due to fall of a heavy object on the upper lateral side of the thigh While the hip is abducted & externally rotated.

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

Because the head is felt in abnormal position (**groin region**).

- **DEFORMITY**:

The hip in the position of flexion, abduction & external rotation

TREATMENT

Closed reduction + external fixation

- Reduction : Under general anesthesia The thigh is flexed, adducted then internally rotated

- Fixation Hip spica for 6 weeks.-

3- Central dislocation



AETIOLOGY (Trauma)

It is actually fracture pelvis. The head of femur passes medially to lay in the pelvis due to fall on the greater trochanter.

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

The head may be felt by **PR** or **PV**.

- **DEFORMITY**:

Adduction form.

TREATMENT

- CLOSED & OPEN REDUCTION METHODS are both difficult & unsatisfactory
- THE BEST MANGEMENT is tibial skeletal traction





III- FRACTURE FEMUR

1- Fracture of the neck of femur

A- Intra-capsular fractures

AETIOLOGY (Trauma)

Direct Common in old age due to senile osteoporosis The trauma may be a **trivial twisting injury** as when the foot catches the edge of a carpet

Indirect Fall from a height.

CLASSIFICATIONS

1- Sub-capital : Immediately below the head of femur!

2- Trans-cervical : Somewhere in the neck of femur._

CLINICAL PICTURE & DIAGNOSIS As general +

- SWELLING :

Due to raised greater trochanter

- DEFORMITY :

The hip is adducted & externally rotated.

COMPLICATIONS

A- General As GENERAL + Special comment on D.V.T as a common complication.

B- Local As GENERAL +

- VASCULAR INJURY : Avascular necrosis of femoral head. due to cutting of retinacular vessels

- BONE COMPLICATIONS : Non-union (very common) due to avascular necrosis & senility.

TREATMENT

A- If young patient

Open reduction + internal fixation by **CANNULATED SCREWS**

B- If old patient

1- HEMIARTHPLASTY (Partial hip arthroplasty)

i.e. Replacement of the head of femur by a prosthesis e.g. Austin-moore or cemented Thompson.

2- TOTAL HIP REPLACEMENT

If associated osteoarthritis.











B- Extra-capsular fractures

AETIOLOGY (Trauma)

Direct Fall on the side producing a blow over the greater trochanter

Indirect Fall from a height.

CLASSIFICATIONS

1- Trochanteric fractures :

Down to the level of lesser trochanter.

2- Subtrochanteric fractures

From the lesser trochanter to 8 cm below.

CLINICAL PICTURE & DIAGNOSIS As general +

- **DEFORMITY**:

The hip is adducted & externally rotated.

COMPLICATIONS

A- General As GENERAL +

Special comment on **D.V.T** as a common complication.

B- Local As GENERAL +

- NO Avascular necrosis

- BONE COMPLICATIONS : Mal-union (very common)

TREATMENT

A- If fit patient

Open reduction + internal fixation by **DYNAMIC HIP SCREW (D.H.S)**





B- If unfit patient

SKELETAL TRACTION

e.g. BOHLER FRAME

- By a special pin introduced transversely at upper end of tibia.





2- Fracture of the shaft of femur

AETIOLOGY (Trauma)

Direct As motor car accident, birth injury (**breech**).

Indirect Fall from a height on straight legs.









- DEFORMITY	Proximal fragment	Distal fragment
Upper 1/3 fracture	Flexed by iliopsoas, abducted by glutei, externally rotated by obturator externus.	Pulled up & adducted by adductors.
Middle 1/3 femur	The powerful thigh muscles cause angulation & over riding	
Lower 1/3 femur = supra-condylar	Pulled forwards by quadriceps	Pulled backwards by gastrocnemius.

COMPLICATIONS

A- General As GENERAL

B- Local

1- SKIN INJURY with associated compound fracture.

2- MUSCLE & TENDON : Myositis ossificans of quadriceps femoris.

- 3- VASCULAR INJURY : Volkmann's ischemic contractures of the leg flexors popliteal vessels injuries especially with supracondylar fracture.
- 4- NERVE INJURY : popliteal nerve injury especially with supra-condylar fracture.
- 5- BONE COMPLICATIONS : Mal-union causing shortening.

6- JOINT : Osteoarthrosis of knee joint 2^{ry} to mal-union.

TREATMENT

A- General management (1st AID TRETMENT)

- 1- Sterile dressing over the wound.
- 2- Anti-shock measures & analgesics.
- 3- Immobilize the fractured part without reduction.
- 4- Sedation for the patient e.g. Morphia.
- 5- Full examination to exclude other injuries.

B- Treatment of fracture (According to the AGE)

⇒ New born

The fracture is splinted over **tongue depressor** & the limb is bandaged to the abdomen with hip flexion.

⇒ Children up to 4 years

BRYANT'S METHOD OVER GALLOW SPLINT

- This is a skin traction applied to the thighs while the hip is flexed 90° & knee extended.
- The buttocks are elevated above the head to produce counter-traction and facilitate nursing the bowel.

⇒ Age between 5-15 years

SKIN TRACTION ON THOMAS SPLINT

- Technique :
 - Skin traction through adhesive plaster.
 - **Thomas splint**: The cord is from adhesive plaster are tied to the end of the splint

• Disadvantages :

- ① Complications of prolonged bed rest
- ² Liability to stiffness of the knee joint.
- ③ Soft tissue interposition → Non union.











⇒ Adult & old age

OPEN REDUCTION & INTERNAL FIXATION (Fit patient)

- Method by intra-medullary nail or plate & screws.
- Complications :
 - ① Introduce infection.
 - ^② Mechanical block of near by joint (if nail too long)
 - ③ Improper fixation (if nail too short).
 - ④ If thick nail it may break the bone.



SKELETAL TRACTION ON BOHLER FRAME (Unfit patient)

- Method by a special pin introduced transversely at upper end of tibia.
 - The **traction** is applied distally by weights.
 - The **counter-traction** depends upon the body weight acting by elevating the foot of bed.



N.B.: The best with supra-condylar fracture :

Closed reduction with skeletal traction on Bohler's splint or Open reduction & internal fixation by plate & screws

IV- FRACTURE PATELLA

AETIOLOGY (Trauma)

Direct Direct blow to the anterior aspect of the flexed knee.

Indirect Severe muscular contraction of quadriceps muscle i.e. Avulsion

TYPES

FISSURED
FRACTURETRANSVERSE
FRACTURECOMMINUTED
FRACTURESTAR SHAPED
FRACTUREImage: Comparison of the state of t

CLINICAL PICTURE As general +

- SWELLING :

Due to hemoarthrosis of knee joint

- DEFORMITY :

Fingers can be dipped in transverse fracture.

DIAGNOSIS (X-ray).

COMPLICATIONS (Local) As general +

1- SKIN INJURY with associated compound fracture.

- 2- MUSCLE & TENDON : Tear of quadriceps expansion causing loss of extension.
- 3- BONE COMPLICATIONS : Non-union

because of ① Distraction of the 2 fragments. ② Soft tissue interposition.

4- JOINT INJURY : Hemoarthrosis of knee joint & stiffness.

TREATMENT

A- If fissure fracture Elastic bandage + knee splint for (3 weeks)

B- If transverse fracture Fixation by wire & screws or partial patelectomy.

C- If comminuted fracture Total patelectomy.







V. FRACTURE TIBIA & FIBULA

AETIOLOGY (Trauma)

- Fracture one bone : Direct trauma only.

- Fracture both bones :

- Direct : Blow will break the bones at same level.
- Indirect : Results in oblique fractures at different level

CLINICAL PICTURE As general

DIAGNOSIS (X-rays)







COMPLICATIONS (Local) As general +

- 1- SKIN INJURY with associated compound fracture.
- 2- VASCULAR INJURY of popliteal artery in fracture proximal tibia.

3- BONE COMPLICATIONS : Cross union (between **tibia** & **fibula**) if fracture at **same** level

4- JOINT INJURY : Stiffness of ankle & knee.



A- Undisplaced fractures Above knee cast 6 weeks.

B- Displaced fractures Opened reduction

+ internal fixation by **plate & screws** of tibia **only** _

N.B.: We use external fixator if comminuted fracture.









VI- DISLOCATION OF THE ANKLE

Pott's fracture



AETIOLOGY (Trauma)

Classified according to mechanism of injury \mathfrak{P}

	Stage I	Stage II	Stage III
1.External rotation	Lat. Med.		
2.Abduction injury	ALL ALL		Talus D
3.Adduction injury			Calcaneous
4.Vertical compression injury			20

	External Rotation	Abduction injury	Adduction injury	Vertical compression
Stage	Spiral # of lateral	Transverse # of	Transverse # of	Fall from a height
I.	maleolus	medial maleolus	lateral maleolus	→ neutral position
		or tear of deltoid	or tear of lateral	→ burst # ankle.
		ligament.	ligament	
Stage	Stage I + # of	Stage I + # of	Stage I + # of	Fall on
II	medial maleolus or	lateral maleolus	medial maleolus	dorsi flexion,
	tear of deltoid	with lateral	with medial .	leads to anterior
	ligament with	dislocation talus.	dislocation talus.	marginal # tibia
	lateral dislocation			
	talus.			
Stage	Stage 2 + # of	Stage 2 + # of	Stage 2 + # of	Fall on
- 111	posterior margin	posterior margin	posterior margin	plantar flexion
	tibia & postero-	tibia & postero-	tibia & postero-	leads to posterior
	lateral dislocation talus.	lateral dislocation talus.	medial dislocation talus.	marginal # tibia

CLINICAL PICTURE & DIAGNOSIS As general +

- DEFORMITY :

depends on the stage.

DIAGNOSIS (X-rays)





COMPLICATIONS (Local) As general +

- 1- BONE COMPLICATIONS : Mal-union or non union
- 2- JOINT INJURY : Osteoarthrosis & stiffness of ankle joint
- 3- Sudek's atrophy (See page 98).

TREATMENT

A- Fracture one maleolus without displacement

Below knee cast for 6 weeks.

B- Displaced pott's fracture

Open reduction + internal fixation by screws

C- Physiotherapy

To prevent ankle stiffness




Injuries of spine

THE SPINE & SPINAL CORD

I- FRACTURE OF THE SPINE

Thoraco-lumbar spine injury

	Stable		Unstable	
	Wedge compression	Comminuted fracture	Fracture dislocation	
Trauma	Flexion injury e.g. fall of a heavy object on the bent of the back	Vertical compression as fall from a height	Flexion-rotation forces → rupture of posterior ligament → dislocation.	
Pathology	 Front of the vertebral body is compressed 	 Body of the vertebra is broken. 	 Lateral & forward displacement of the vertebral body. 	
	- Intact posterior ligament.	 Intact posterior ligament. 	 Rupture posterior ligament. 	
	- Rare spinal cord injury	- Rare spinal cord injury	- Damage of spinal cord	
C/P As general +	Mild symptoms with localized tenderness	Marked symptoms than wedge fracture	Severe symptoms & shock "Neurogenic"	
Diagnosis	Plain x-ray CT	Plain x-ray CT scan & MRI more accurate in diagnosis		
		0		

A- General As GENERAL +

- Shock : Neurogenic

- Paralytic ileus & acute gastric dilatation

due to 玲

- 1- Retro-peritoneal hematoma.
- 2- Sympathetic over-stimulation.

- Complications of prolonged recumbancy

- ① Bed sores.
- 2 D.V.T.
- ③ Respiratory complications.
- ④ Pulmonary embolism.
- ^⑤ Urinary calculi.
- 6 Constipation.
- ⑦ Psychological complications.

B- Local As general

<u>+</u> Traumatic paraplegia

TREATMENT

A- General management (1st AID TRETMENT)

- 1- Sterile dressing over the wound.
- 2- Anti-shock measures & analgesics.
- 3- Immobilize the fractured part without reduction.
- 4- Sedation for the patient e.g. Morphia.
- 5- Full examination to exclude other injuries.

B- Treatment of fracture

A- WEDGE COMPRESSION :

Rest in bed on **firm mattress** till pain subsides + Active exercise for back muscles + pain killers.

B. COMMINUTED FRACTURE :

Plaster jacket in a straight position for 3 month

C. UNSTABLE FRACTURE DISLOCATION :



by plate & screws then plaster jacket

N.B.: Traumatic paraplegia

Should be written from neurology in details as a complication of fracture spine + the care of paraplegia



II- INFLAMMATION OF THE SPINE

T.B of the spine

Pott's disease

INCIDENCE

- Age : Any age (75 % < 10 years).
- Sex : Equal sex.

AETIOLOGY

- Organism : Human or bovine T.B.
- Route of infection : Blood borne 2^{ry} to 1^{ry} T.B elsewhere

PATHOLOGY

- The disease usually affects 2 or 3 adjoining vertebrae with destruction of intervertebral disc.
- The disease may short as [™]

1- INTRA-OSSEOUS (Central type)

T.B osteomyelitis of children \rightarrow collapse of vertebrae \rightarrow angular deformity kyphosis.

2- PERIOSTEAL (Peripheral type)

T.B periosteitis of adult \rightarrow para-vertebral abscess \rightarrow compression of the cord \rightarrow paraplegia.

CLINICAL PICTURE

A- General T.B toxemia

- B- Local
 - 1- PAIN : Local dull aching at site of the disease & 11 with movement
 - 2- LOCALIZED TENDERNESS : Can by elicited by percussion over the affected vertebrae

3- RIGIDITY & LIMITATION OF SPINAL MOVEMENTS :

① Rigidity is elicited by lifting the patient from his feet while in the prone position \rightarrow **No** concavity of the spine.

② Limitation of movements(Coin test) To get a coin from the ground the patient h

To get a coin from the ground the patient has to flex his knees instead of flexion of the spine.

COMPLICATIONS

1- Cold abscess :

At 1st it collects under the anterior longitudinal ligament then trickle along various anatomical planes to appear at sites far from the site of original pathology

- CERVICAL REGION

- ① Retropharyngeal abscess.
- ^② Posterior triangle of the neck.





- THORACIC REGION

- ① Mediastinal abscess.
- 2 Empyema of pleura.

- LUMBAR REGION

- ① Psoas abscess (In psoas sheath).
- ② Iliac abscess (In iliac sheath).

2- Paraplegia : 10 %

- A- Early due to [≥]
 - $\ensuremath{\mathbbm O}$ Pressure by a cold abscess on the cord.
 - ^② Pressure by sequestrated piece of bone.
 - ③ T.B meningitis or T.B. myelitis.
- B- Late due to angular kyphosis.
- 3- Deformity : Angular kyphosis.

INVESTIGATIONS

- 1- E.S.R., Tuberculin test, chest x-ray.
- 2- Bacteriological examination of aspirated pus.

- ① 2 or more vertebrae are affected.
- ② Intervertebal disc space is lost.
- ③ Soft tissue shadow of abscess

TREATMENT

A- Conservative treatment

(uncomplicated pott's disease)

- 1- Anti-tuberculous drugs for 9 months
- 2- Rest & good nutrition
- 3- Spine support by plaster jacket

B- Surgical treatment

(Complicated pott's disease)

1- COLD ABSCESS

A- If accessible : e.g. posterior triangle. Aspiration is done

B- If not accessible : Costo-tranaversectomy

i.e. excision of transverse process & part of the rib then aspiration.











2- PARAPLEGIA

A- Reversible paraplegia :

Evacuation of cold abscess through antero-lateral decompression. It is an extension of **costo-tranaversectomy** with removal of **pedicle** & **lateral part** of the body of the vertebra.



B- Irreversible paraplegia

Conservative & nursing measures i.e. care of bladder & bowel.

3- KYPHOSIS Physiotherapy

Bone deformities

BONE DEFORMITIES

I- DEFORMITIES OF UPPER LIMB

1- Deformities of the elbow

Normally the forearm is in a position of slight abduction with the arm constituting an angle of about **10 - 15**° known as the carrying angle.

1- Cubitus valgus

- In cubitus valgus, this angle is increased so that the hand deviates away from the body.
- The most common cause is <u>mal</u>-union of a supra-condylar fracture of humerus, it leads to delayed ulnar neuritis.
- The deformity itself needs no treatment but for delayed ulnar palsy, the nerve transported to the front of the elbow.

2- Cubitus varus

- In cubitus varus, this angle is decreased so that the hand deviates towards the body.
- The most common cause is <u>mal</u>-union of a supra-condylar fracture of the humerus.
- > The deformity can be corrected by **a wedge osteotomy**

2- Deformities of the wrist & hand

1- Made-lung deformity

- It occurs in young patient where there is arrest of growth of the radius.
- > The wrist & hand will **deviate** to the radial side.
- > Excision of lower end of ulna is needed.

2- Dupuytren's contracture

- > It is a flexion deformity of the fingers.
- > Due to progressive **contraction** of palmar fascia.
- > Treated by fasciotomy or excision of palmar fascia.

3- Polydactly

- Supra-numeral finger.
- > The extra-finger should be amputated.

4- Syndactly

- **Fusion** of adjacent fingers.
- Two or more fingers are joined together by a web of skin. The web is divided & the raw areas are covered by graft















II- DEFORMITIES OF HIP JOINT

Congenital hip dislocation

INCIDENCE

- 1 : 1000 new born babies.
- Girls > boys.
- Lt. hip > Rt. hip.

AETIOLOGY

- $\ensuremath{\textcircled{}}$ There is a familial tendency
- ② Intra-uterine malposition
- ③ Postnatal posture

PATHOLOGY

- The **acetabulum** is unusually shallow.
- The femoral head slides out posteriorly then upwards.
- The joint capsule is stretched.

CLINICAL PICTURE

By (observant mother)

Waddling gait with asymmetry of the buttocks.

With unilateral dislocation

① The skin creases lie at **different** levels on the two sides.

^② The affected leg is slightly short & rotated externally.

Bilateral dislocation :

It is more difficult to be detected, because there is **no** asymmetry.

EXAMINATION

1- Ortolani's test :

The baby's thigh are held with the middle finger behind the greater trochanter which is pressed forwards. So the test is **+ve if there is a click** during the **abduction manoeuvre** indicating that the hip has been reduced.

2- Barlow's test :

If the hip already reduced, the **adduction manoeuvre** will allow the femoral head to be gently out of the socket

INVESTIGATIONS

1. X-ray.

It is of **little** value in the newborn because the head of femur is cartilaginous i.e. not visible.

2. U/S scanning

Can visualize the shape of the acetabulum & the position of the femoral head





TREATMENT

(According to the age)

1- In the newborn

Wait for 3 weeks, if the hip is still unstable, it is reduced in abduction & splinted in abduction (**Von Rosen splint**) this is maintained for 3 - 6 months.

2- Between the age of 6 months to 6 years

Gradual closed reduction is applied & splintage for 12 months then operative reduction.

3- After the age of 6 years

Open reduction + formation of a shelf at the superior acetabular margin to deepen it & prevent re-dislocation.

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III- DEFORMITIES OF KNEE JOINT

1- Genu valgum

Knock knees

DEFINITION

Fixed abduction of the legs from middle line.

CAUSES

- 1- Idiopathic : the commonest & bilateral.
- 2- Rickets
- **3- Static :** long standing in wrong position.

CLINICAL PICTURE

The knees knock together & on walking the patient flex the knees slightly.

TREATMENT

- A. Conservative Physiotherapy
- B. Operative Mc Ewen's supra-condylar osteotomy



Bow legs

DEFINITION

Lateral bowing deformity of the leg.

CAUSES Similar to genu valgum.

CLINICAL PICTURE

The medial maleoli touching each other

TREATMENT Similar to genu valgum.







IV . DEFORMITIES OF THE FOOT



Club foot

DEFINITION

- ⇒ **TALIPES :** Means deformity of hind-foot.
- ⇒ **EQUINES :** Means planter flexion of ankle.
- ⇒ VARUS : Consists of ₹
 - Inversion of the heel
 - Adduction of the fore-foot

INCIDENCE

- Common deformity of foot.
- Boys : girls (2 : 1).
- Bilateral = **1/3** of cases.

AETIOLOGY

A- Congenital

Commonest congenital skeletal deformity.

B- Acquired

- Paralytic : polio or lat. popliteal n. injury.
- Spastic : Hemiplegia.
- Cicatericial : Extensive scaring after trauma.
- Decubitus : Prolonged bed rest with pressure on the dorsum of foot.

CLINICAL PICTURE & DD

	CONGENITAL	PARALYTIC
ONSET	Since birth	Following cause.
SIDE	Bilateral	Uni lateral
MUSCLES	Good tone	Paralyzed
ABILITY TO WALK	Can on outer side of foot	Patient can't walk

TREATMENT

A- Stretching & splinting

Treatment begins within 2 or 3 days of birth for 6 - 8 weeks until the foot is over corrected.

B- Operation for (resistant cases)

The Tendo-achillis is lengthened & the planter flexors are elongated or divided & held in plaster cast.

C- Treatment after correction

Splintage continues until the child starts walking.







Before

2- Flat foot

Pes plannus

DEFINITION

Loss or flattening of the longitudinal arches of the foot.

A. Congenital

Congenital vertical talus.

B. Acquired

- 1- Spasmodic : Spasm of long extensors of the toes.
- 2- Traumatic : Fracture of small bones of foot.
- 3- Paralytic : Flaccid paralysis of tibial muscles.
- 4- Static (postural) : Most common due to bad posture
 + muscle hypotonia especially with prolonged standing.

N.B.: The arches of foot are kept by :

- **1- Ligaments :** e.g. Spring, deltoid & plantar ligaments.
- 2- Short Muscles of sole & long tendons from back of leg.

STAGES

- 1- Acute foot strain : i.e. Painful swollen foot.
- 2- Chronic = Mobile flat foot. If neglected painless & flat foot.
- 3- Rigid flat foot i.e. irreversible.

TREATMENT

A- If mobile :

Rest, physiotherapy & special boots

B- If rigid :

Wedge tarsectomy







Flat Arch

Bone & joint inflammations

BONE INFLAMMATIONS

I- ACUTE HEMATOGENOUS OSTEOMYELITIES

INCIDENCE

- Age : Almost disease of CHILDREN.
- Sex : Mate > female.

AETIOLOGY

Organism

Usually staphylococcus aureus (**80 %**) & others as streptococcus pyogenes, streptococcus hemolyticus ... etc.

Predisposing factors

Following a mild trauma \rightarrow hematoma at **metaphysis** of long bones. The hematoma is infected from circulating bacteria (**septic focus**).

Route of Infection

Hematogenous from **septic focus**.

PATHOLOGY (Resulting pus spread)

Transversely

Raising the periosteum → Sub-periosteal abscess which ²

- ① Opens on skin surface \rightarrow Skin sinus.
- ② Spreads intra-articular → Septic arthritis

Vertically

Through the medullary cavity which may interrupt blood flow in nutrient artery \rightarrow Necrosis of bone \rightarrow separation of bone \rightarrow Sequestrum.

Blood stream

Leads to → Pyaemia.

CLINICAL PICTURE

Type of patient Usually male & child.

General Fever, Headache, Malaise & Anorexia

Local

1- Severe pain over metaphysis with hotness, redness & edema of overlying skin.

2- Limitation of movement of painful limb.

3- Picture of complications :

- ① Subperiosteal abscess & skin sinus.
- ² Septic arthritis & pyaemia.
- 3 Chronicity & pathological fracture.



DIFFERENTIAL DIAGNOSIS

1- Cellulitis = No tenderness over bone.

2- Rheumatic arthritis = Fleeting character + carditis.

3- Ewing's sarcoma = Swelling is diaphyseal + characteristic x-ray.

INVESTIGATIONS

A- Laboratory

Leucocytosis, 1 ESR & +ve blood culture.

 B- Radiological (X-ray)
 Normal during the 1st 2 weeks then rarefaction appears.

C- Aspiration of pus the most diagnostic

TREATMENT

A- General treatment

Rest in bed + A.B as **Flucloxacillin** or **Cephalosporins**

B-Local treatment

Rest of the limb in a splint to \downarrow pain & toxemia.

⇒ If no response in 24 hours

Surgical drainage (under general anesthesia & tourniquet) By evacuation of sub-periosteal abscess.

N.B. : Some surgeons advise drilling of the cortex To evacuate any pus in the medullary cavity.

II. CHRONIC NON SPECIFIC OSTEOMYELITIS

1- Following improper ttt of acute osteomyelitis

PATHOLOGY

1- Sequestrum :

Separated dead piece of bone 2^{ry} to interference with its blood supply.

2- Abscess cavity :

Containing the sequestrum.

3- Involucrum :

New bone formed by the raised periosteum from chronic irritation.

4- Cloaca :

Multiple openings evacuating pus out through the involucrum.

5- Multiple sinuses : Discharging pus over skin.





CLINICAL PICTURE

History of acute osteomyelitis.

Symptoms

- General : Fever, Headache, Malaise & Anorexia.
- Local : Pain & swelling at bone.

Signs

Bone thickening & tenderness + multiple skin sinuses.

INVESTIGATIONS (X-ray)

Sequestra in a cavity surrounded by involucrum.

TREATMENT

- **1- Sequestrectomy :** Removal of **sequestrum** by opening the cavity in bone.
- 2- Saucerization of bone cavity.
- **3- Excision** of the sinus tract.

4- Obliteration of the dead space by cancellous bone chips

2- Chronic osteomyelitis from the start

A- Brodie's abscess

DEFINITION

Localized suppurative chronic osteomyelitis affecting patient with good resistance low virulence staph, albus.

PATHOLOGY

A chronic bone localized abscess at **metaphysis** of long bone & surrounded by dense sclerosed bone containing pus.

INVESTIGATIONS (X-ray)

There is a translucent area surrounded by sclerosis.

TREATMENT

Under antibiotic covering the cavity is deroofed.

B- Garre's type

DEFINITION

Non suppurative chronic osteomyelitis affecting patient with good resistance low virulence staph, albus.

PATHOLOGY

Excessive bone formation which may encroach the **medullary** canal of **shaft** of long bones

INVESTIGATIONS (X-ray)

Excessive bone at medullary canal..

TREATMENT

Guttering of the cortex to release the tension in the medullary canal.





JOINT INFLAMMATIONS

SEPTIC ARTHRITIS

INCIDENCE

- AGE : Common in children.
- **ORGANISM :** Mainly staphylococcus aureus.

• ROUTE OF INFECTION :

- ① **Hematogenous** : Commonest from a distant focus affecting one or many joints (pyaemic joint)
- ② From outside : Compound dislocation (rare) or penetrating wounds.
- ③ From adjacent bone : Osteomyelitis (rare).
- ③ From intra-articular injection or aspiration Through contaminated needle

PATHOLOGY

• THE SYNOVIAL MEMBRANE (Synovitis)

becomes red, swollen & exudes pus.

• THE ARTICULAR CARTILAGE (condrolysis).

i.e. Articular cartilage destruction with exposure of both bone ends.

• LIGAMENT & MUSCLE SPASM when pus burst outside the joint.

CLINICAL PICTURE

Symptoms

- General : Fever, Headache, Malaise & Anorexia.
- Local : Severe throbbing pain & swelling of the affected joint.

Signs

- ① Joint deformity with limitation of movement.
- 2 Redness, hotness & edema overlying joint.
- ③ Muscle spasm.

DIFFERENTIAL DIAGNOSIS

- **1- ACUTE OSTEOMYELITIS**
- **2- RHEUMATIC FEVER**
- **3- HEMOARTHROSIS**

COMPLICATIONS

- **1- CHRONIC ARTHIRITS**
- 2- PYAEMIA

3- PATHOLOGICAL DISLOCATION

due to tension of joint, muscle spasm & ligament laxation.





INVESTIGATIONS

A- Laboratory

Leucocytosis & † ESR.

B- Radiological (X-ray)

Normal during the **1**st **2 weeks** then rarefaction appears of the articular ends of bone & narrow joint space.

C- Aspiration of pus the most diagnostic -

TREATMENT

A- General treatment

Rest in bed + A.B as **Flucloxacillin** or **Cephalosporins**

B-Local treatment

1- Repeated aspiration of joint & local injection of antibiotics.

N.B.: Value of aspiration :

- ① Diagnostic.
- ② Therapeutic (↓ pain, ↓tension & ↓ toxemia)
- ③ **Prognostic** (follow up)

2- Arthrotomy (open drainage)

INDICATIONS

- ① Failure to respond to aspiration.
- 2 Thick pus i.e. difficult aspiration
- ③ Suction irrigation.

TECHNIGUE

Joint opened, pus evacuated, washed with saline, instilled with penicillin. Capsule is closed using plain catgut & skin left open + 2^{ry} suture after 1 week.

3-Splintage of joint

In best position of function indicated if the articular cartilages are completely destroyed.





Generalized disorders of bones & joints

I- PAGET'S DISEASE

Osteitis deformans

INCIDENCE

(Rare) more in males between 50 -70 years.

(**Unknown**) but it may be due to disturbance of endocrinal control of bone metabolism

PATHOLOGY

- Site : The disease is usually generalized but the bones principally affected are skull, spine, pelvis & lower limbs.
- At first the bones are decalcified & soften.
- Later on the bones are greatly thickened by deposition of sub-periosteal bone.

CLINICAL PICTURE

Dull aching bony pain, 1 size of head, thickening & bending of bones **Gorilla like appearance** to the patient.

COMPLICATIONS

- 1- NERVE COMPREESION (blindness & defness)
- **2- PATHOLOGICAL FRACTURES**
- 3- OSTEOARTHROSIS of the joint adjacent to deformed bone.
- 4- OSTEOSARCOMA

TREATMENT

No treatment except when complications arise.

II - Perth's disease

Osteochondritis juveniles of the hip

INCIDENCE & CAUSES

Idiopathic disease of children.

PATHOLOGY

- At first the femoral head becomes ischemic, softened & fragmented.
- Later on bone repair takes place & the deformity is well established.

CLINICAL PICTURE

The child complains of intermittent limping.

TREATMENT

A. ACUTE PHASE : Bone traction to prevent deformities.

B. IF THE DEFORMITY IS ESTABLISHED : Corrective osteotomy





Bone tumors



A- Ivory (compact) osteoma

INCIDENCE

- Rare benign tumor.
- It occurs with adolescent & young adult.

PATHOLOGY

- **ORIGIN** : Arises from membranous bone.
- SITE : Skull or mandible.
- N/E : Rounded, conical or sessile at outer surface.

CLINICAL PICTURE

• Asymptomatic mass except if complicated.

COMPLICATIONS (Depend on site)

- 1- OUTER SKULL TABLE : Stretch skin leads to localized alopecia.
- 2- INNER SKULL TABLE : Compresses the brain.
- 3- ORBIT : Proptosis.
- 4- NOSE : Block air sinuses.
- 5- EXTERNAL AUDITORY MEATUS (E.A.M): Deafness & vertigo.

INVESTIGATIONS (X-ray)

Shows a **sessile** plaque of dense bone.

TREATMENT

Never turns malignant. So excision with complicated cases only



B- Cancellous osteoma

(OSTEOCHONDROMA - CARTILAGE CAPPED EXOSTOSIS)

INCIDENCE

- **Common** benign tumor.
- It occurs with adolescent & young adult.

PATHOLOGY

- ORIGIN : Arises on external surface of bone capped by cartilage
- **SITE :** Metaphysis of long bones especially around the knee.
- N/E : Smooth, pedunculated bony swelling covered by a cape of cartilage.

N.B.: It tends to moves away from epiphysis

CLINICAL PICTURE

- It may be **single** or **multiple** (hereditary multiple exostoses).
- Asymptomatic mass except if complicated.

COMPLICATIONS

1- COMPRESSION ON 🏷

- ① Nerves leads to pain or paraesthesia
- 2 Vessels leads to distal ischemia.
- 3 Joint leads to mechanical block.

2- SARCOMATOUS CHANGES (5 %)

Known by 🏷

- ① Pain & rapid growth.
- ② Invasion of mother bone.
- ③ Recurrence after excision.

INVESTIGATIONS (X-ray)

Shows a well defined bony swelling emerging from metaphysis.

TREATMENT

Excision with its base + biopsy.

C- Osteoid osteoma

INCIDENCE

It affects < 30 years & usually male.

PATHOLOGY

- **ORIGIN** : Benign osteoblastic lesion.
- SITE : Shaft of long bone (> 50 % femur or tibia).
- N/E : Small lesion < 1 cm & rounded or oval in shape





CLINICAL PICTURE

Painful small lesion which sometimes severe).

INVESTIGATIONS (X-ray)

Small **radiolucent** area surrounded by dense sclerosis with central small **nidus** of calcification.

TREATMENT

The only effective treatment is removal of nidus

[D] Osteoblastoma

(GIANT OSTEOID OSTEOMA)

IT DIFFERS FROM OSTEOID OSTEOMA by 🏷

- ① Large in size (>1 cm).
- ② Less painful.
- 3 No reactive bone.
- ④ It Occurs in vertebrae, ribs, hand & foot.

INVESTIGATION (X-ray)

Well demarcated osteolytic lesion, the surrounding sclerosis is not always.

TREATMENT

Excision & bone grafting.

.....

2- Chondroma

INCIDENCE

It affects **short long** of hands & feet.

PATHOLOGY

- **ORIGIN :** It is a benign tumor characterized by formation of mature cartilage.
- **SITE :** Situated centrally (**En**chondroma). or eccentric (**Ec**chondroma).
- N/E : Lobulated mass of cartilage.

CLINICAL PICTURE

- Mild painful swelling with pathological fracture.
- It may be solitary or multiple (Ollier's disease)

INVESTIGATION (X-ray)

- Well defined radiolucent shadow with frequent calcification
- Enchondroma causes thinning of cortex with little or no expansion.
- Ecchondroma causes eccentric expansion of cortex.

TREATMENT

Curettage & bone grafting.



ECchondroma



	II- LOCALLY MALIGNANT	III- MALIGNANT TUMORS
	3- Osteoclastoma	4- Osteosarcoma
Pathology	Giant cell tumor	Bone ghost
• Origin :	Uncertain but most probably spindle cells	Osteoblasts (osteolytic or osteosclerotic)
• SITE :	Epiphysis of long bone especially around knee & humerus.	Metaphysis of lone bone especially around knee & humerus.
• N/E :	 Slowly growing causes bone expansion with thinning of the cortex. 	 Rapidly growing causes erosion of the cortex i.e. "Bone ghost".
		-The periosteum becomes raised & the tumor spreads sub-periosteally.
	 Intra-medullary spread never occur. 	 Intra-medullary spread will occur.
	- The articular car	tilage is preserved.
	- Reddish & fleshy appearance	- Osteolytic : Soft, fleshy & vascular with areas of Hge & necrosis
		- Osteosclerotic : Solid & contain bone
		IT SHOWS 4 PATHOLOGICAL FEATURES.
		1- Bone destruction (ghost)
		2- Tumor bone formation(Sun rays appearance)on radiology.
		3- Reactive bone formation (Codman's triangle) on radiology.
		4- Soft tissue infiltration.

	LOCALLY MALIGNANT	MALIGNANT TUMORS	
	Osteoclastoma	Osteosarcoma	
	Giant cell tumor		
	032-3		
• M/P:	Giant cells spindle cells	osteoid cells	
	- CELLS : Spindle cells + multinucleated giant cells	- CELLS : Cellular pleomorphism with osteoid cells.	
CLINICAL PICTURE	- MATRIX : Stroma with no bone or cartilage .	- MATRIX : Stroma with bone or cartilage.	
• Age :	20 - 40 years	10 - 20 years	
	After epiphyseal union.	Before epiphyseal union.	
• SEX :	Male = female	Male > female	
• SYMPTOMS :	1- Pain at end of long bone.	1- Pain is 1 st symptom.	
	2- Bony swelling before pain.	2- Bony swelling after pain.	
	3- Pathological fracture (common).	3- Pathological fracture (rare).	
• SIGNS :	 SWELLING : Well defined edge. At end of long bone. Variable in consistency with egg-shell crackling sensation 2- L.Ns : Not detected. 	 Swelling : III defined edge. At shaft of long bones. Variable in consistency. 2-1 Ns - Hard & painless 	
	1 Dethological fracture	1. Forly blood metastasis	
COMPLICATION		I - Early blood metastasis.	
	2- Recurrence rate (common).	2- Pathological tracture (rare).	

	LOCALLY MALIGNANT	MALIGNANT TUMORS
	Osteoclastoma	Osteosarcoma
INVESTIGATION A- X-ray	Giant cell tumor	
	 Soap bubbles appearance. Expanded cortex. Medullary plug = Operculum. Respect articular cartilage. 	 Bone destruction (ghost) Tumor bone formation (Sun rays appearance) Reactive bone formation (Codman's triangle) Soft tissue infiltration. Respect articular cartilage.
B- CT scan & MRI	Diagnostic	Diagnostic give idea about metastasis.
C- Chest x-ray	(-ve) metastasis	(+ve) metastasis
D- Biopsy	To confirm the diagnosis	

N.B.: Variants of osteosarcoma

1- PAROSTEAL (JUXTACORTICAL) TYPE :

- Slowly growing occurs in adult (> 20 years)
- It arises from external bone surface with late medullary invasion

2- PERIOSTEAL OSTEOSARCOMA :

Rare involve short segment of cortex of tibial shaft. The medullary cavity **not** involved.

3- OSTEOSARCOMA IN **P**AGET'S DISEASE :

- High grade anaplastic tumor occurs with old age **> 50** year.
- 4- Post-irradiation sarcoma of bone.
- 5- INTREOSSEOUS LOW GRADE osteosarcoma
- 6- INTREOSSEOUS HIGH GRADE osteosarcoma





A- Osteoclastoma (LOCALLY MALIGNANT)

1- The simplest treatment is curettage & bone graft, but recurrence Is common.

2- Wide excision (the choice) with replacement by prosthesis.

3- Amputation is indicated for tumors which recur with increasing evidence of malignancy

B. Osteosarcoma (1^{RY} MALIGNANT)

1- Amputation : (The Main)

N.B.: The level of amputation

- Should be proximal to the joint above the tumor
- e.g. Osteosarcoma at the tibia is treated by an

above knee amputation

2- Limb preserving surgery :

Excision of the tumor & **bone replacement** with prosthesis or bone graft with pre & post-operative radiotherapy.

3- Chemotherapy may be used after above mentioned lines to improve prognosis.

.....

5- Chondrosarcoma

INCIDENCE

It occurs with 40 - 50 years (Male > female).

PATHOLOGY

- **ORIGIN :** Malignant tumor characterized by formation of cartilage
- SITE : Mostly in pelvic bone & upper end tibia
- N/E : 2 types 🏷
 - A. Primary :

Arises spontaneously in previously normal bone.

- B. Secondary :
 - Occurs on top of multiple enchondromatosis.

CLINICAL PICTURE

- ① Dull ache pain.
- 2 Gradual enlarged mass.
- ③ Pathological fracture.

INVESTIGATION (X-ray)

Tumor shadow with radiolucent areas of cartilage spotted with area of calcifications (**very fluffy**)

TREATMENT

Wide local excision (radio-resistant).





6- Ewing's sarcoma

INCIDENCE

- Rare malignant tumor.
- It occurs 10 20 years (Male > female)

PATHOLOGY

- ORIGIN : malignant endothelioma of bone marrow
- SITE : Diaphysis of long bones
- N/E : Soft, grayish like mass starting at diaphysis then erodes the cortex, raising the periosteum which will react by new bone formation as the process repeat itself.
 So it gives onion peel appearance
- M/E : Rounded cells arranged in a rosette around the blood vessels .

CLINICAL PICTURE

- ① Painful warm bony swelling (The chief presenting features).
- ② Intermittent increasing in temperature.

DIFFERENTIAL DIAGNOSIS

- Acute osteomyelitis :

Biopsy will establish the diagnosis

SPREAD

A- Blood born metastasis Early to lungs & other bones.

B- Lymphatic spread To regional lymph nodes.

INVESTIGATIONS

A- Laboratory Leucocytosis, 1 ESR

B- Radiological (X-ray)

Onion peel appearance

C- Bone scan

May shows multiple areas of activity in the skeleton.

D- CTscan & MRI

Reveal the local extent of the tumor.

TREATMENT

The prognosis is always poor

So the best result from combination of chemotherapy & radiotherapy as pre-operative then **amputation**.

Then a further course of chemotherapy for 1 year is given





IV. METASTATIC BONE DISEASE

INCIDENCE

Metastatic deposits >1^{ry} bone tumor.

SOURCE

Direct As cancer tongue infiltrate mandible.

Blood As thyroid, lung, breast, supra-renal, kidney & prostate.

PATHOLOGY

Site Commonest in skull, sternum, ribs, vertebrae & pelvis.

- N/E Osteolytic causing bone destruction.
 - Osteosclerotic causing bone formation.

CLINICAL PICTURE

Picture of 1ry tumor +

- ① Severe bony pain.
- ^② Pathological fracture
- ③ Palpable bony swelling (rarely).

INVESTIGATIONS

A- Laboratory

Serum alkaline phosphatase is often 11 also serum acid phosphatase is 11 with cancer prostate

B- Radiological (X-ray)

Shows osteolytic activity

C- Bone scan

May shows multiple areas of activity in the skeleton.

TREATMENT

1- Chemotherapy & radiotherapy .

- 2- Hormonal treatment may be helpful.
- 3- Internal fixation for pathological fracture.







CARDIOTHORACIC



Chest injuries

CHEST INJURIES

AETIOLOGY (Trauma)

A- Closed trauma

- 1- Direct : Blunt trauma e.g. car accident.
- 2- Indirect : Blast injuries to the chest.

B- Opened trauma

- 1- Gunshot wounds.
- 2- Punctured due to stabbing.

THE FOLLOWING INJURIES MAY OCCUR

- 1- RIBS : 1- Simple fracture. 2- Flail chest.
- **2- PLEURA : 1- Pneumothorax. 2- Hemothorax.**
- 3- LUNGS : 1- Contusions. 2- Lacerations.
- 4- C.V.S : 1- Cardiac injuries. 2- Great vessels injury.
- **5- DIAPHRAGMATIC INJURIES**
- **6- OESOPHAGEAL INJURIES**

CAUSES OF DEATH

VENTILATION MAY BE SERIOUSLY AFFECTED IN CHEST INJURIES due to P.

- ① Severe pain due to rib fractures.
- ② Instability of the chest wall due to the presence of a flail segment.
- ③ Lung collapse due to hemothorax or pneumothorax..
- **④** Pulmonary contusion.
- S Accumulation of secretions in the tracheobronchial tree.
- ⁽⁶⁾ **Depression of respiratory center** due to associated head injury.

MANAGEMENT OF ANY CHEST INJURY

I- First aid treatment

" Pre-hospital management "

Then Transfer the patient to hospital

- ① Ensure patent airway if patient is unconscious
- ^② Control of bleeding by compression
- ③ Sterile dressing to prevent contamination.





Definitive treatment

" Hospital management "

The American College of Surgeons developed the Advanced Trauma Life Support (ATLS)

ATLS protocol has 3 elements : 1- Primary survey / resuscitation

A = **A**ir way maintenance.

B = **B**reathing.

C = **C**irculating i.e control bleeding.

D = **D**isability i.e. support any fracture.

E = **E**xposure of the patients.

2- Secondary survey

3- Definitive treatment of individual injuries

Primary survey / resuscitation

A- Airway

1- CLEAR AIRWAY

- Vomitus, blood or foreign material should be removed, this is followed by chin lift or jaw thrust.

2- AIRWAY CONTROL

- 1- Oro- pharyngeal tube to prevents backward falling of the tongue
 - 2- Endotracheal tube is indicated with P>
 - a. Apnea.
 - b. Inhalation injuries.
 - c. Maxillofacial trauma
 - d. Closed head injuries

3- CERVICAL CONTROL

- Cervical spine immobilization is done using a backboard and a rigid collar

B- Breathing

ASSESSMENT

⇒ Inspection for chest movement, respiratory rate, cyanosis, open chest wound & expansion.

- ➡ Palpation for subcutaneous emphysema & flail segments.
- ➡ Percussion for hyperresonance or dullness over lung field
- ⇒ Auscultation for air entry & adventitious sound.







LIFE THREATENING CONDITIONS & THEIR TREATMENT

- ① Flail chest : Immobilized by cotton pad & adhesive plaster from sternum to spine
- ② Tension pneumothorax : Deflated by needle which is inserted in 2nd inter-costal space
- ③ Massive hemothorax : Under water seal drainage

C-Circulation

ACTION

- ➡ Control of bleeding by local compression, elevation or packing
- ➡ Anti-shock measures
- ⇒ ECG monitoring.
- ⇒ CPR for cardiac arrest.

D Disability

- Common causes of neurological deficits related to trauma are Head injury, hypoxia, shock , alcohol or drug abuse

AVPU Evaluation based on patient's best response.
Alert & interactive.
Vocal stimuli elicit a response
Painful stimuli are necessary to produce a response
Unresponsive

- A more detailed assessment using Glasgow Coma Scale (GCS)

E. Exposure

- Clothes of the trauma victim are removed using a sharp large scissors.

THEN �

- Insert **1** Urethral catheter (Foley's) to monitor urine output. this is contraindicated if there rupture urethra

> Nasogastric tube (Ryle's) to decompresses the stomach & to prevents vomiting or aspiration pneumonia

N.B.: Proper history taking (AMPLE)

- Allergies
- Medications
- Past medical history
- Last meal (time)
- Events of injury

Secondary survey

- The secondary survey is to be done after resuscitation


- It includes examination of P>

- Head & neck
- Pace & spine
- Chest & abdomen (diagnostic peritoneal lavage) are indicated in blunt abdominal trauma
- Ø Perineum (including rectal & vaginal examinations if females)
- O Nervous system
 - > Pupils for size, equality & reaction to light
 - ➤ GCS
 - Cranial nerves
 - Sensation & motor activity in limbs
- 6 Limbs

After1st aid treatment, the following investigations are done :

1. Laboratory :

- Arterial blood gases to estimate P O₂ & P CO₂.
- Blood sugar for diabetes.
- Blood urea to exclude uremia.

2. Radiological :

- Plain chest x-ray : (A-P & lateral views).
- CT scan chest.
- Duplex scan for vascular injuries.

3. Instrumental :

- ECG, Echo & C.V.P. for cardiac injuries.
- Bronchoscopy : if tracheo-bronchial injury is suspected.
- **Oesophagoscopy** to exclude oesophageal injuries.

II- Definitive treatment

Each condition is treated accordingly

III- Urgent thoracotomy

INDICATIONS

- ① Severe bleeding (> 120 ml/hour).
- ② Initial volume of blood coming though the intercostal tube (> 2 L).
- ③ Persistent bleeding.
- ④ Loculated hemothorax.
- ⑤ Old clotted hemothorax.
- 6 Associated intra-thoracic injuries.

THE FRACTURED RIBS ARE SECURED by stainless steel wires.



UNDERWATER SEAL

DEFINITION

Special method to drain pleural cavity

INDICATIONS

- 1- Pneumothorax
- 2- Hemothorax
- 3- Empyema





TECHNICAL CONSIDERATIONS

- Incision : Small stab is done (local anesthesia) & the tube is pushed up. So drainage is done through 5th space in mid-axillary line
- Other end of tube is passed under surface of water in special bottle
- Bottle should be always 50 cm (at least) below the patient's chest. So that the -ve intra-thoracic pressure cannot suck its content



PRECAUTIONS

- ① Drainage must be helped by chest exercises.
- ^② Chest X-ray is done daily to follow lung expansion.
- ③ During changing bottle, chest tube must be clamped, to avoid sucking air or water into the pleural cavity

REMOVING CHEST TUBE

- Indications :
 - ① All pleural content are expelled.
 - ^② Lung is fully expanded proved by X-rays.
- Technique :
 - ① Chest tube is pulled out & chest wound is immediately closed by stitches
 - 2 Putting adhesive plaster .

I - RIB FRACTURES

A - Isolated fracture of the rib



Spontaneous Muscular violence (rare).

e.g. during violent sneezing, coughing or lifting a heavy object with old people

i.e. senile osteoporosis.

CLINICAL PICTURE

- A. History of trauma.
- B. Generally may reveal associated injuries as spleen, liveretc
- C. Locally
 - 1- Sharp pain increased by breathing & cough.
 - 2- Localized tenderness & crepitus at the fractured site.
 - 3- Complications :
 - ① Surgical emphysema.
 - ② Pneumothorax.
 - ③ Hemothorax.

MANAGEMENT (Not urgent except if complicated)

I- 1st aid treatment & investigations As before

II- Definitive treatment

The Aim with uncomplicated fracture rib is relieving pain by 1- **Strong analgesics** as pethidine or N.S.A.I.Ds.

Support the affected side by adhesive plaster.

- 2- In elderly an elastic corset may be useful
- 3- Inter-costal nerve block.

III- Urgent thoracotomy

Not used except if indicated.



B- Double fracture of ribs (Flail chest)

DEFINITION

Several ribs are broken both anteriorly & posteriorly So a segment of chest wall becomes **flail**

AETIOLOGY (Trauma)

It occurs with severe crush injuries. So leads to \Im

(1) Paradoxical respiration :

- The affected lung collapses during inspiration & expands slightly during expiration.

- This is explained by the fact that the flail part is sucked-in during inspiration & so compresses the lung, driving air form it into the opposite lung. **The reverse occurs during expiration.**

(2) Pendulum respiration :

- **The paradoxical respiration** leads to the oscillation of gases from one lung to the other & results in accumulation of CO₂ in the blood.

(3) Mediastinal flutter :

- It is the movement of the mediastinum from side to side during respiration, this impedes the heart action.



Inspiration

CLINICAL PICTURE As simple fracture rib +

- Increasing dyspnea & cyanosis.
 - ^② Tachycardia.
 - ③ Restlessness.

MANAGEMENT

I- 1st aid treatment & investigations As before

II- Definitive treatment

IF FLAIL SEGMENT IS SMALL

External immobilization by cotton pad + adhesive plaster.

IF FLAIL SEGMENT IS LONG

Internal immobilization by intermittent **+ve p**ressure **b**reathing (**IPPB**).

III- Urgent thoracotomy

Not used except if indicated.







II - PNEUMOTHORAX

DEFINITION

Accumulation of air in the pleura

AETIOLOGY

1- Traumatic pneumothorax :

by either blunt or penetrating injuries.

2- Spontaneous pneumothorax :

by rupture of an emphysematous bulla, cystic lung or T.B. cavity.

3- latrogenic pneumothorax :

by either ₹>



- ① +ve pressure ventilation that is complicated by rupture of alveoli.
- ^② During insertion of a central venous line.

TYPES

There are 3 types :

1- Simple pneumothorax

AETIOLOGY

due to entery of air in the pleura through lung laceration.

CLINICAL PICTURE

Chest pain & slight dyspnea

TREATMENT

- If the amount of air is small (The patient is not dyspneic)
 Conservative treatment until spontaneous absorption takes place.
- If the amount of air is large (The patient is dyspneic)
 An intercostal tube is inserted until expansion of the lung becomes complete.

2- Open pneumothorax = Sucking chest wound

AETIOLOGY

due to sucking chest wound which allow the free entery & exit of air during respiratory movement.

EFFECTS

The normal lung expands, while on open side, air is sucked in the pleural cavity during inspiration & the lung collapses, during expiration as the normal lung collapses, it expels some air in the affected lung which expands slightly $\rightarrow \uparrow$ CO₂ tension in blood.

So leads to \mathfrak{P}

(1) Paradoxical respiration

- (2) Pendulum respiration
- (3) Mediastinal flutter



CLINICAL PICTURE

- ① Chest pain, dyspnea & cyanosis.
- ② There is **absent** breath sound with hyperresonance on the affected side & the mediastinum is **central**.
- ③ Sucking chest wound produces characteristic noise of in-out air movement

TREATMENT (Emergency)

I- 1st aid treatment & investigations As before

II- Definitive treatment



- Immediate application of an adhesive external dressing to stop movement of air through the defect.
- The wound is then repaired in theatre, & intercostal tube is inserted to drain the air in the pleural cavity.



III- Urgent thoracotomy

Not used except if indicated.

3- Tension pneumothorax

AETIOLOGY

due to opening in the pleural cavity either through the chest wall or from the lung, permits entrance of air during inspiration, but **prevents its exit** during expiration i.e. valvular wound

EFFECTS

The air in the pleural cavity accumulates under tension, compressing the lung & displacing the heart & mediastinum towards the opposite side, so the intrathoracic negativity is lost, interfering with venous return & cardiac filling.



Inspiration

Expiration

CLINICAL PICTURE

- ① Severe dyspnea & cyanosis.
- ② There is **absent** breath sound with hyperresonance on the affected side & the mediastinum is **shifted** to **opposite** side.
- ③ Respiratory arrest may occur.
- **④** Local examination
 - Inspection = Cyanosis & congested neck veins.
 - > Palpation = Shift of trachea & mediastinum to opposite site.
 - > **Percussion =** Tympanatic resonance.
 - > Auscultation = \downarrow Breath sound.

TREATMENT (Emergency)

I- 1st aid treatment & investigations As before

II- Definitive treatment



 A short wide bore needle is inserted into the pleural cavity through the 2nd intercostal space, then it is replaced by a tube connected to an under water seal



III- Urgent thoracotomy

Not used except if indicated.



N.B.: Continuous bubbling of air through the intercostal tube Denotes the possibility of a broncho-pleural fistula

III- HEMOTHORAX

DEFINITION

Accumulation of **blood** in the pleura

N.B.: Air may coexist i.e. Hemopneumothorax

AETIOLOGY

1- Traumatic hemothorax :

- From injury to ₹
 - ① Intercostal vessels.
 - ② Internal mammary vessels.
 - ③ Intra-thoracic vessels

2. Spontaneous hemothorax :

- From 🏷
 - ① Tumors of lung, pleura or mediastinum .
 - ② **Ruptured** aortic aneurysm.
 - ③ Blood disease.

CLINICAL PICTURE

A. History of trauma.

B. Generally Shock & signs of internal hemorrhage

- ① Tachycardia & tachypnea (air hunger)
- ^② Hypotension & hypothermia.
- ③ Pale cold skin & oliguria.

C. Locally

- ① Chest pain & dyspnea.
- ^② Local examination
 - Inspection = Unilateral bulge with widely separated ribs & I chest movement.
 - > Palpation = Shift of trachea & mediastinum to opposite site.
 - Percussion = Dullness.
 - ➤ Auscultation = ↓ Breath sound.

COMPLICATIONS

1- Defibrination :

by heart & lung movement so that blood remains fluid for several days.

2- Clotting with deposition of fibrin on pleural surfaces.

3- Organization :

Fibrin \rightarrow fibrous membrane which encapsulates the lung interfere with chest wall movements \rightarrow **Frozen chest**

4- Infection : leads to empyema.





MANAGEMENT

I- 1st aid treatment & investigations As before

especially (chest x-ray) which shows >>

⇒ If the hemothorax is < 500 ml

It will lead only to obligation of costo-phrenic angle.

⇒ If large amounts

It will lead to an opacity rising to the axilla.

⇒ If hemo-pneumothorax :

The pleura shows air (**pneumo**) & fluid (**hemo**) level with collapsed lung.

II- Definitive treatment

1- Repeated daily aspiration :

[If 1 -1.5 L blood] Until chest is dry & x-ray shows complete re-expansion of lung.

2- Inter-costal tube :

[If > 1. 5 L blood] Inserted at 7th intercostal space mid-axillary line.

III- Urgent thoracotomy

Not used except if indicated.

N.B: Old clotted Hemothorax

- 1. Liquefaction of the clot by streptokinase.
- 2. **Neglected cases : Decortication** of pleura surgically.

.....

A- Acute empyema

IV- EMPYEMA

DEFINITION

It means **pus** in the pleural cavity which if evacuated, the lung can expand completely.

AETIOLOGY

(Route of infection)

1- Direct : Open wound, post-traumatic or post-operative

2- Local spread :

From rib, lung, oesophagus or diaphragm.

3- Blood spread :

(Rare) e.g. pyemia.











PATHOLOGY (4 Types)

- 1- Pneumococcal empyema : Follows labor pneumonia (Metapneumonic) pus is thick, greenish with heavy fibrin deposits.
- 2- Streptococcal empyema : During bronchopneumonia (synpneumonic) pus is thin, generalized & localization is late.

3- Staphylococcal empyema :

Spread from staph, pneumonia in children

4- Putrid empyema :

Due to rupture of lung abscess.

CLINICAL PICTURE

- A. History of original disease..
- B. Generally Toxemia [Fever, Headache, Malaise & Anorexia].

C. Locally

① Chest pain, dyspnea & cyanosis

- ^② Local examination
 - Inspection = Unilateral bulge with widely separated ribs & + chest movement.
 - Palpation = Shift of trachea & mediastinum to opposite site.& I.V.F.
 - Percussion = Dullness.
 - > Auscultation = \downarrow Breath sound.

INVESTIGATIONS

A- Laboratory Leucocytosis

B- Radiological (Plain x-ray chest) Similar to pleural effusion

C-Instrumental (Aspiration)

To confirm diagnosis & to allow the identification of organism by culture & sensitivity test.

TREATMENT

A- General treatment

Antibiotics, tonics & oxygen.

B- Local treatment Evacuation of pus by P>

1- Repeated aspiration :

Used with early stages with **thin** pus, children & also in diffused empyema.

2- Closed drainage :

By an intercostal tube connected to under water seal. Used with children with **thick** pus i.e. when aspiration fails.

3- Open drainage : Rib resection

Indicated with chronic empyema or failure of closed drainage



B- Chronic empyema

DEFINITION

It is an empyema in which the lung is **unable** to expand after evacuation of pus

TYPES

I- Open chronic empyema (Chronic sinus)

It is due to inadequate treatment of acute empyema.

- ① Inadequate drainage (too early, too late, too high or too low).
- ② Inadequate post-operative care as early removal of the tube.
- ③ Underlying disease e.g. osteomyelitis of ribs or lung abscess

II- Closed chronic Empyema

Encysted empyema or recurrent empyema

III-Broncho-pleural fistula

CLINICAL PICTURE

B. Generally Toxemia [Fever, Headache, Malaise & Anorexia] with anemia & clubbing of fingers.

C. Locally

- ① Chronic sinus in chest wall discharging pus.
- ② Empyema necessitans (rare) Which perforates an intercostal space → S.C. abscess.
- ③ Local examination (Progressive fibrosis)
 - > Inspection = crowding ribs & scoliosis deformity of spine.
 - > Palpation = Shift of trachea & mediastinum to same site.

INVESTIGATIONS

A- Laboratory Leucocytosis

B- Radiological

1- Plain x-ray (chest)

Shows the underlying cause & effect of fibrosis.

2- Lipidol pleurogram :

Shows the size of the cavity & any bronchial communications.

TREATMENT

A- General treatment

Antibiotics, tonics & correct anemia.

B-Local treatment

1- Re-drainage by rib resection :

In a suitable level & proper physiotherapy to allow lung expansion and cures 70 % of cases within 3 months

2- Decortication :

Which is complete excision of the thickened visceral pleura and then the lung is expanded by positive pressure.

V- CARDIAC ARREST

DEFINITION

Sudden cessation of effective circulation & respiration.

N.B.:

- 1- C.N.S. :Tolerates 3 5 minutes of anoxia before irreversible cellular damage occurs.
- 2- If the respiration stops 1st → The circulation will continue for several minutes but if circulation stops 1st → The respiration stops within 1 minute.



AETIOLOGY

A- Causes of 1^{ry} cardiac arrest

- > Hypoxia from respiratory obstruction or shock.
- > Hypothermia.
- Hypokalemia
- ➤ Acidosis.
- > Irritant drugs : Chloroform, adrenaline.
- > Myocardial disease : Myocarditis, arrhythmia & infarction.

B- Causes of 1^{ry} respiratory arrest

- > Upper air way obstruction.
- Respiratory failure e.g. overdose of curare drugs.
- > C.N.S. depression : head injury, overdose of narcotics.

C- Causes of cardiac & respiratory failure

- Chest injuries.
- Extensive lung collapse.
- > Acute pulmonary embolism.

CLINICAL PICTURE

(Cardinal signs of cardiac arrest)

- ① Absent carotid pulse.
- ^② Absent gasping respiration.
- ③ Dilated pupils

TREATMENT

1- External cardio- pulmonary resuscitation C.P.R

> The aim :

Is not to restart the heart but to provide an artificial circulation & ventilation

> The technique : By closed cardiac massage

 By compression with both hands the lower 1/3 of sternum against the spine at a rate of **60/min**. while the patient is laid flat on the ground.



2- Mouth to mouth breathing

at a rate of 15/min while closing the nostrils.





2- At hospital

Mouth to mouth breathing is replaced by endo-tracheal tube & mechanical ventilation.



3- Treatment after correction of arrest

- ① **Continuous observation** & monitoring for possible re-arrest.
- ^② Correct any predisposing factor like electrolyte disturbance or hypoxia.
- ③ Give Na HCO₃ to correct metabolic acidosis which develops during arrest

CORONARY ARTERY BYPASS GRAFT

CABG

DEFINITION CABG is used to do the pumping action of the heart

INDICATIONS

- ①. Stenosis of main stem of left coronary artery.
- ② 3 vessel disease, particularly in diabetics.
- **③ Myocardial infarction**

VALUE

CABG surgery aims to relieve the pain of angina.

TYPES OF GRAFTS

1- Veins

- ① Long saphenous vein (the commonest)
- **②** Short saphenous vein
- 3 Arm vein.

2- Arteries

- ① Internal thoracic artery (the commonest)
- 2 Radial artery
- **③ Rt. Gastroepiploic artery**.

TECHNIQUE

- (a) **Incision :** Median sternotomy by a saw incision to the pericardium
- (b) **CABG** is done
- (c) The sternum is wired with 5 to 6 stainless steel wires.
- (d) Drains are usually placed to the opened pericardium
- (e) The pericardium is usually left open.

COMPLICATIONS

- **①** Palpitation (Atrial fibrillation).
- ② Leg swelling & pain
- ③ Sternal dehiscence.



Post-operative pulmonary complications

POSTOPERATIVE PULMONARY COMPLICATIONS

PREDISPOSING FACTORS

A- Pre-operative causes

- 1- Age : Extremes of age are more liable to complications
- 2- Sex : Male > Female due to smoking.
- 3- Chronic bronchitis.
- 4- Dehydration.

B- Operative & post operative causes

1- Anesthesia :

- ① Premeditations with atropine.
- ^② Trauma to the tracheo-bronchial tree
- ③ Inhalation of blood or vomitus
- $\textcircled{\sc 0}$ Prolonged unconsciousness.

2- Nature of operation :

Thoracic & upper abdominal operations

3- Abdominal distention :

e.g. paralytic ileus interfere with movements of the diaphragm

4- Inhibition of cough reflex by [™]

- ① Pain.
- 2 Heavy narcotics.

PATHOPHYSIOLOGY

3 Factors leads to **1** incidence of post operative lung complications

① After upper abdominal surgery :

The vital capacity of the lungs often drops to as low as 25 % of its pre-operative value.

- 2 Elevation & improper movement of diaphragm from pain.
- ③ Smoking or associated chronic bronchitis.

PREVENTION

A- Pre-operative

- 1- Prohibit smoking.
- 2- Correct dehydration.
- 3- breathing exercises.

B- Operative

ANESTHETIST AVOIDS

- 1- Cyanosis
- 2- Excessive atropinization.
- 3- Excessive narcotics.
- 4- Deep anesthesia.
- 5- Vomiting.



SURGEON AVOIDS

- 1- Rough manipulation.
- 2- Undue prolongation.
- 3- Tight bandage.
- 4- Tight strapping of chest & abdomen.

C- Post-operative

- 1- Avoid heavy sedation.
- 2- Postural drainage.
- 3- Correct dehydration.
- 4- Clear secretion.
- 5- Early ambulation

TYPES OF COMPLICATIONS

- 1. Bronchitis.
- 2. Broncho-pneumonia.
- 3. Lung collapse (atelectasis) (see later)
- 4. Lung abscess (see later)
- 5. Pulmonary embolism (see later)

6. Mendelson's syndrome

- Causes : Aspiration of vomitus during induction of anesthesia in patient with full stomach
- Clnical picture : Wheezes, cyanosis, tachycardia, tachypnea & hypotension
- Investigation: X-ray chest shows widespread lung infiltration.
- Treatment :
 - Antibiotics + proper ventilation + bronchial aspiration.
- 7. Adult respiratory distress syndrome [ARDS]
 - Causes : due to 3
 - ① Multisystem trauma.
 - ^② Severe abdominal or generalized sepsis.
 - ③ Extensive burns.
 - ④ Severe shock from any cause.
 - ⑤ Lung injury.

• Defects occur in 3 respiratory processes :

- ① Defective ventilation
- ^② Defective perfusion
- ③ Defective diffusion
- Treatment :

The patient should be admitted to an intensive care unit (I.C.U)

1- Treatment of the cause

e.g. correction of shock & eradication of sepsis.

2- Respiratory support

Endo-tracheal tube + mechanical ventilation.

LUNG ATELECTASIS

Pulmonary collapse

PREDISPOSING FACTORS

As before

PATHOLOGY

- Obstruction of bronchus by plug of mucus
- → absorption of air distal to the obstruction Upper lobe
- → deflation & collapse of the affected area which may be ³√
 - ① Lobular : Collapse of scattered areas throughout the lung Diaphragm
 - ② Lobar : Collapse of one lobe.

③ massive lung collapse :

Collapse of the whole lung.

CLINICAL PICTURE

Symptoms

- The onset is sudden with fever, dyspnea, cyanosis & chest pain .
- Cough is slight & sputum is scanty viscid
- The condition may subside after few days with the expectoration of a considerable amount of purulent tenacious mucus

Signs

- General :

Unexplained tachycardia.

- Local :

The affected side of the chest is flattened with dullness on percussion, $\frac{1}{2}$ breath sound & mediastinal shift towards the side of collapse. As the attack subsides coarse crepitations may appear

INVESTIGATIONS

(Plain x-ray chest)

Shows lung collapse with approximation of the ribs, elevation of the diaphragm & mediastinal shift towards the affected side .

PREVENTION

As before

TREATMENT

A- Initial measures

- ① Turning the patient from side to side
- ^② Percussing the affected side
- ③ Mucolytics & encouraging expectoration .
- B-Suction if aeration doesn't occur within 6 8 hours .
- **C- Antibiotics** to prevent infection & ambulation from bed



LUNG ABSCESS

AETIOLOGY

- 1- Inhalation of vomitus or F.B during (coma or operation)
- 2- Post-pneumatic or post-traumatic
- 3- Pyemia i.e. pyemic abscess

PATHOLOGY

1- Pneumatic stage

There is area of **consolidation** & if it is superficial there will be overlying acute pleurisy

2- Stage of acute abscess

Suppuration occurs in the consolidated area. The pus will be discharged into a near-by bronchus

3- Stage of chronic abscess

The wall becomes **thick** by **fibrous tissue** & the covering pleura shows thickening & fibrous adhesions.

FATE & COMPLICATIONS

- 1- Rupture into bronchus.
- 2- Spread to (lung, pleura or pericardium)
- 3- Chronic abscess.

CLINICAL PICTURE

A. History

Sudden onset of high fever, pleuritic pain & dry irritative cough.

B. Symptoms

Expectoration of large amounts of offensive & purulent sputum with marked improvement of general condition later on.

C. Signs

- General : Early toxemia but improved later on.
- Local : Signs of consolidation.

INVESTIGATIONS

A- Laboratory

Sputum analysis

B- Radiological

Plain x-ray (chest)

Shows consolidation or cavitation.

C-Instrumental

Bronchoscopy to detect foreign bodies...etc.

TREATMENT

A- Conservative Antibiotics & postural drainage.

B- External drainage (rarely) done.

C- Lobectomy for chronic abscess or complicated abscess



PULMONARY EMBOLISM

INCIDENCE

- It is the most common cause of unexplained death after operations
- About 2 3% of all hospital death.
- The following groups of patients are risky (malignancy, orthopedics & D.V.T)

AETIOLOGY

It is usually a complication from D.V.T

CLINICAL PICTURE

- A. Asymptomatic With no evidence of DVT in most of cases.
- B. Symptomatic [4 groups] (8 -10 day post-operative)

1- Fatal pulmonary embolism :

i.e. **Main** pulmonary artery is obstructed. Acute chest pain, shock & death within few minutes.

2- Massive types :

i.e. **Incomplete** obstruction of the main pulmonary artery. Cyanosis, shock & death within hours.

3- Pulmonary infarction :

i.e. Presence of **small** embolus. Chest pain, dyspnea & signs of consolidation.

4- Recurrent embolism :

i.e. Repeated small infarctions

DD Myocardial infarction & heart failure

INVESTIGATIONS

A- Laboratory

- Blood gases : Normal P CO₂ & + P O₂

B- Radiological

1- Plain x-ray :

May show vascular markings in obstructed area.

2- Pulmonary angiography :

May show filing defect inside the artery or obstructed artery.

3- Doppler U/S & duplex :

May detect occult **D.V.T** in lower limb.

C-Instrumental

- ECG for exclusion of myocardial infarction







A- Conservative

1- Anticoagulants & Morphia (to + pain)

- 2- Antibiotics & Atropine (to + bronchial spasm)
- 3- Oxygen inhalation.

B- Fibrinolytic therapy

Injection of **streptokinase** or **urokinase** through a catheter in pulmonary artery.

C- Pulmonary embolectomy

Surgical embolectomy if all mentioned above are failed .

D- Venous thrombectomy

For residual clot in the lower limb

E- Prevention of recurrent embolism

Through vena-caval filter.

BRONCHOGENIC CARCINOMA

INCIDENCE

- There is increasing incidence in last 30 years.
- Age : 50 70 years
- Sex : male > female

PREDISPOSING FACTORS

- ① Excessive **smoking**
- ² Exposure to irradiation.
- ③ Bronchial adenoma

PATHOLOGY

Site • Central of hilum :

Arising in main bronchus & invades the mediastinum

- Peripheral hilum : Arising in small bronchus & invades the pleura
- Pancost tumor :
 - Arising at apex of lung & invades sympathetic trunk.
- N/E Fungating, malignant ulcer, nodular or infiltrating mass.

M/E • Squamous cell carcinoma 60 %

- Anaplastic 30 %
- Adenocarcinoma 10 %

SPREAD

Direct To other parts of lung, pleura, mediastinum ...etc.

Lymphatic To hilar L.Ns → para-tracheal L.Ns → cervical L.Ns



Lungs

Cancer

Blood Bone, liver & brain

CLINICAL PICTURE

A. General symptoms :

Malaise, anorexia & loss of weight

B. Broncho-pulmonary presentations

- Asymptomatic : discovered accidentally.
- Symptomatic : Hemoptsis, bronchial obstructions, pneumonia

C. Pleural presentations :

Malignant effusion, serous transudate, chylous effusion, empyema or dry pleurisy.

D. Mediastinal presentations :

Cough, dyspnea, chest pain or hemoptsis.

E. Metastatic presentations :

- Liver : pain at Rt. hypochondrium & jaundice
- Bone : bony aches & pathological fractures .
- Brain : blurring vision, vomiting ...etc.

INVESTIGATIONS

A- Radiological

- Plain x-ray : Shows coin shadow___
- CT scan : Diagnostic

B-Instrumental

- Bronchoscopy & biopsy
- Mediastinoscopy
- Needle biopsy

TREATMENT

A- Operable

Lobectomy or radical pneumonectomy .

B-Inoperable

Palliative resection + chemotherapy + radiotherapy.





Neurosurgery

HEAD INJURIES

CLASSIFICATIONS

- I- SCALP injuries
- II- Skull fractures :
 - Fractures of skull vault
 - Fractures of skull **base**
- **III- Intra-cranial injuries**
- IV- Acute extra-dural hematoma.
- V- Sub- dural hematoma (acute & chronic)



Scalp

wound

Fracture

Swelling,

bruising

* Definition

It is the soft tissue covering the vault of the skull.

* Layers (structure) of the scalp

- 1- Skin .
- 2. Connective tissue.
- Aponeurosis (Galea aponeurotica).
- 4- Loose areolar tissue.
- 5- Pericranium (periosteum)
- * Extent
 - 1. ANTERIORLY Supra-orbital margins.
 - 2. POSTERIORLY Superior nuchal line.
 - 3. ON EACH SIDE Temporal lines.
- * Arterial supply

Superficial temporal artery.

* Venous drainage

Superficial temporal vein.

* Lymphatic drainage

A. THE ANTERIOR PART OF THE SCALP

drains into the pre-auricular & Parotid L.Ns.

B. THE POSTERIOR PART OF THE SCALP

drains into the post- auricular & occipital L.Ns.



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- Loss of conscio
 - consciousness Nasal discharge

Stiff neck

I - SCALP INJURY

WOUNDS OF THE SCALP

Characterized by :

- ① **Bleeding** is very excessive \rightarrow shock.
- ② Healing is very rapid.

TYPES

Subcutaneous hematoma	Subgaleal hematoma	Subperiosteal hematoma (Cephal hematoma)
Hematoma is confined to the dense S.C layer	It occupies the loose areolar tissue under the galea aponeurotica.	Hematoma is under the periosteum
ATT	A STATE	CTT A
Small, painful and moves with the scalp over the skull.	Large, soft fluctuating swelling reaching anteriorly to the supra-orbital ridges, posteriorly to the nuchal lines, & laterally to the temporal lines.	The hematoma is limited by the suture lines to the underlying bone usually the parietal.

TREATMENT

A. Treatment of open wounds

Closure is in 2 layers :

- a- Galea to galea by absorbable sutures.
- b- Skin to skin by non-absorbable sutures.

B. Treatment of hematoma

- 1- Subcutaneous hematoma : It will resolve spontaneously.
- 2- Sub-galeal hematoma
- 3- Subperiosteal hematoma



Aspiration & pressure bandage.

II- SKULL FRACTURES

1- Fractures of the skull vault

AETIOLOGY

(Trauma) usually direct by 3 mechanism

- ① Local Indentation : by object e.g. hammer.
- ⁽²⁾ Compression of skull e.g. car accident.
- **③ Missile injuries.**

PATHOLOGICAL TYPES

1- Fissured fracture

- (a) Simple : without scalp lacerations.
- (b) Compound : with scalp lacerations

2- Depressed fracture

- (a) Simple : Without scalp lacerations.
- (b) Compound : with scalp lacerations.

N.B.: Open fractures :







i.e. compound (fissured or depressed) fractures carry the risk of P

- ① Escape of intra-cranial content (blood or CSF).
- ② Introducing foreign bodies to brain.
- ③ Introducing infection as meningitis or encephalitis.

CLINICAL PICTURE

1- Fissured fracture

(a) Simple :

- ① Hematoma over it.
- ² Fissure can **not** be seen or felt through intact scalp

(b) Compound :

- ① Escape of blood.
- ^② Fissure can be seen & felt through lacerated scalp.

N.B.: D.D from suture lines which present in anatomical site & its zigzag shape

2- Depressed fracture

(a) Simple :

- ① Hematoma over it.
- ^② Depression can be seen or felt through intact scalp.

(b) Compound :

- ① Escape of blood.
- ^② Depression can be seen or felt through lacerated scalp.

COMPLICATIONS

1- Fissured fracture Usually nothing

2- Depressed fracture

- ① Dural tear.
- ② Infection as meningitis.
- ③ Epilepsy. which is Early Epilepsy (within 1 week after the injury) or Late Epilepsy (within 1-4 years after the injury)
- ④ Cosmetic deformity.
- © Severe bleeding from one of the venous sinuses.
- 6 Associated brain injury.

INVESTIGATIONS

- 1- Skull (x-ray) shows type, site, size & shape of fracture
- 2- C.T scan
- 3- MRI

TREATMENT

See management of cerebral injuries

- 1. Fissured fracture
 - (a) Simple : Left under observation if no neurological damage
 - (b) Compound : Exploration by small burr hole

if suspecting an extra-dural hematoma.

2. Depressed fracture

- (a) Simple: Conservative treatment
 - **Unless** ① Large depressed segment > 1 inch.
 - ② Depressed segment compresses an important area.
 - ③ Depressed segment causing cosmetic deformity.
- (b) Compound : Exploration by burr hole in surrounding skull bones
 + elevation of depressed bone by bone elevator + deal with any intra-cranial injury.

.....

INDICATIONS FOR ADMISSION TO HOSPITAL

- OF PATIENTS WITH HEAD INJURY
- 1. Any depression of level of consciousness.
- 2. Skull fracture.
- 3. Focal neurological signs.
- 4. Persistent headache or vomiting.
- 5. Absence of responsible relatives who observe the patient for the1st. 24 hours



2- Fractures of the skull base

AETIOLOGY (Trauma)

A- Direct trauma

By penetrating sharp objects or bullets through mouth.

B- Indirect trauma

- **1- To vault :** Produces fracture base by bursting.
- 2- To face : Maxilla transmits force to anterior cranial fossa
- 3- To chin : Mandibular condyles transmit force to middle cranial fossa.
- 4- To spine : Fall on the heels or buttocks pushes the spine against posterior cranial fossa.

PATHOLOGY

- Fracture base is often compound.
- There are 3 groups of associated lesions 1- Escape of blood, C.S.F., brain matter through the openings (nose & ear)
 - 2- Associated cranial nerve injuries.
 - 3- Associated brain injury from trauma.

CLINICAL PICTURE

I- Anterior Cranial fossa

1- Escape of intracranial contents :

- **Blood** \rightarrow Epistaxis + black eye.
- **C.S.F** \rightarrow salty taste + C.S.F rhinorrhea.
- Brain matter \rightarrow may escape from the nose.

	SUBCONJUNCTIVAL HEMORRHAGE FROM	SUBCONJUNCTIVAL HEMORRHAGE FROM	
	LOCAL TRAUMA	FRACTURE BASE	
1. TRAUMA	To the eye	To the head	
2. CONSCIOUSNESS	Not affected	May be loss of consciousness	
3. Onset	Immediate	Delayed	
4. Shape	Triangular with base to cornea	Triangular with apex to cornea	
5. Post limit	Definite	Can not be seen	
6. COLOUR	Bright red	Dark red	





2- Cranial nerve injury :

Olfactory, optic, occulomotor, ophthalmic or abducent.

3- Associated brain injury.

II- Middle cranial fossa

1- Escape of intra-cranial contents :

 Blood → Epistaxis if fracture involves nasal sinuses ± bleeding per ear if torn tympanic membrane.



• **C.S.F** \rightarrow From the ear

2- Cranial nerve injury :

Mandibular & maxillary division of the 5th nerve & the 8th nerve may be injured.

3- Associated brain injury.

III- Posterior cranial fossa

1- Escape of intra-cranial contents :

Blood may occur in occipital region
 → Occipital hematoma .

2- Cranial nerve injury

9th, 10th, 11th in jugular foramen 12th is protected by strong condyloid process.

3- Associated brain injury.

INVESTIGATIONS

1- C.T scan

2- MRI

N.B: X-ray doesn't shows the fracture

TREATMENT

See management of cerebral injuries

1- Prevention of infection

By strong **antibiotics + pluging** the ear with sterile cotton but avoid irrigation.

2- Control of C.S.F leakage

- \Rightarrow Patient is nursed in a semi-sitting position.
- \Rightarrow Warn the patient not to blow the nose.
- \Rightarrow If discharge persists after 10 days \rightarrow should be surgically repaired.

3- Treatment of associated brain injuries

III- INTRA-CRANIAL INJURIES

AETIOLOGY [Trauma]

- 1- OPEN INJURIES : Sharp objects or bullets.
- **2- CLOSED INJURIES.**

MECHANISM OF INJURY

1- FACTORS THAT AFFECT SEVERITY OF CEREBRAL INJURY

- 1. Distortion of the brain
- 2. Mobility of the brain in relation to the skull & membranes.
- **3. Configuration of the interior of the skull :** Smooth areas of the skull will cause less damage.
- **4. Age of the patient :** A young patient will have a better chance of recovery

2- EXTRA-CRANIAL FACTORS THAT AFFECT THE CEREBRAL INJURY

- Respiration : Hypoxia & ↑ PCO₂ can aggravate the development of severe brain odema & venous congestion
- 2. Blood volume & blood pressure : Hypovolemia may lead to irreversible cerebral ischemic damage.
- 3. Fluids : Intravenous infusion of hypotonic fluids leads to \uparrow brain odema
- **4. Temperature :** A rise in body temperature will cause a further deterioration in neurological state due to ↑ metabolic rate.

PATHOLOGY

A- 1^{ry} pathological sequelae

- Cerebral concussion : There is slight brain functions distortion but without any organic damage

- Cerebral contusion & compression :

There are areas of bruising & odema of the cortical gyri producing

→ prolonged period of unconsciousness + physical signs of focal neurological damage

B- 2^{ry} pathological squelae

① Brain odema : Clinically simulates the picture of brain compression without focal manifestations.

- ② Intra-cranial hemorrhage : Which may be extra-dural, sub-dural or Intra-cerebral.
- ③ Vascular changes with ischemic necrosis.
- ④ Coning : Herniation of the contents due to ↑ Intra-cranial pressure as foramen magnum herniation.
- **⑤** Brain stem injury, infection & C.S.F. rhinorrhea



IV- ACUTE EXTRA-DURAL HEMATOMA

Middle meningeal artery or vein injury

AETIOLOGY

- Usually due to **a trivial trauma** applied to the side of the skull causing a fracture of temporal or parietal bone.
- The dura is driven inwards & tearing of the anterior or posterior branches of **middle meningeal artery** or **vein** leading to accumulation of blood in extra-dura space.

PATHOLOGY

The blood escapes in 3 directions :

- ① **Outwards** through the fracture \rightarrow boggy swelling under temporalis muscle.
- ② **Upwards** over the parietal region.
- ③ **Downwards** into the middle cranial fossa.

N.B.: An extra-dural hematoma can occur without a skull fracture especially in children as they have an elastic skull

CLINICAL PICTURE 3 stages :

1- Stage of concussion

- > Sudden loss of consciousness, relaxed muscles & closed eyes.
- > Rapid weak pulse with slow & shallow respiration.
- > Subnormal temperature & hypotension.
- Pale, cold & clammy skin.
- Reflexes are lost & sphincters are relaxed.

2- Stage of lucid interval

- It is a time needed for accumulation of hematoma enough to produce compression.
 - **N.B.1- The patient may passes** from concussion to compression with brief lucid Interval i.e. missed.
 - 2- If the source of bleeding is venous The lucid interval will prolonged.

3- Stage of compression

- Early (irritation) :

Headache, irritability, confusion & drowsiness with convulsion.

- Late (depression).:

Semi-coma or coma with hemiplegia.



N.B.: Signs of lateralization = side of decompression

- Side of scalp hematoma.
- Side of skull fracture in x-ray.
- Side of initial constriction then dilatation of pupil.
- Opposite side of convulsions.
- Finally, Terminal compression
 - = decerebrate rigidity \rightarrow death.

DIFFERENTIAL DIAGNOSIS

ACUTE EXTRADURAL HEMATOMA	ACUTE SUBDURAL HEMATOMA
(1) Usually mild trauma	(1) Severe trauma.
(2) Usually mild brain damage	(2) Severe brain damage
(3) Lucid interval may be present	(3) Persistent loss of consciousness without lucid interval.
(4) The hematoma is usually unilateral	(4) Commonly bilateral & extensive.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI
- 3- Carotid angiography



TREATMENT

See management of cerebral injuries

➡ Urgent exploration to evacuate the hematoma & deal with the bleeders before late compression occur.

 Site of exploration : is indicated by signs of lateralization (usually centered at pterion = 4 cm above & behind external auditory meatus).





⇒ If middle meningeal artery :

- At foramen spinosum : Bleeding control by a plug.
- Within the dura : Under running suture.
- At bony tunnel : Bone wax or crushing the bony canal over the vessel.

⇒ If venous sinuses :

• Suture the tear in the sinus wall





V- SUBDURAL HEMATOMA

1- Acute sub-dural hematoma

AETIOLOGY

It is due to severe blow to the skull

PATHOLOGY

It crosses the subdural space to reach the fixed subdural venous sinuses.

CLINICAL PICTURE & D.D

See DD from acute extradural hematoma

INVESTIGATIONS

1- C.T scan

2- MRI

3- Carotid angiography

TREATMENT

See management of cerebral injuries





(Usually serious brain damage with mortality rate **50** %). The dura mater is opened in cruiciate fashion to allow rapid decompression of the brain.

2- Chronic sub-dural hematoma

AETIOLOGY

2^{ry} to a slight blow to head with elderly persons & alcoholics.

PATHOLOGY

Sudden displacement of the brain causes rupture of superior cerebral veins as they pass to the venous sinuses.



N.B. : This hematoma is bilateral in 50 % of cases

CLINICAL PICTURE

(The interval between trauma & symptoms varies between weeks to months)

- **Symptoms** are vague & consists of chronic headache, mental apathy.
- Physical signs may be absent.

N.B. :The condition may be diagnosed as ⇒ psychosis or cerebrovascular accident.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI
- 3- Carotid angiography

TREATMENT

Evacuation through burr holes.

If the blood is thick, bi-frontal burr holes are done & the subdural space is washed with saline.



Management of cerebral injuries

Management of closed head injuries

The management of patient with head (cerebral) Injuries : Must follow a planned program as follows :

- 1. Dealing with the life saving priorities.
- 2. Initial examination & 2ry survey
- 3. Performance of the necessary investigations.
- 4. Continuing care & observations.
- 5. Possible need for surgery to evacuate an intracranial hematoma.

1. Dealing with life saving priorities (A.B.C)

A- Airway

1- CLEAR AIRWAY

 Vomitus, blood or foreign material should be removed, this is followed by chin lift or jaw thrust.

2- AIRWAY CONTROL

- 1- Oro- pharyngeal tube to prevents backward falling of the tongue
- 2- Endotracheal tube is indicated with P>
 - a. Apnea.
 - b. Inhalation injuries.
 - c. Maxillofacial trauma
 - d. Closed head injuries

3- CERVICAL CONTROL

- Cervical spine immobilization is done using a backboard and a rigid collar

B- Breathing

Take care that difficult breathing causes brain congestion

which lead to :

- ① Increased C.S.F.
- ② Increased bleeding.
- 3 Brain oedema.

C-Circulation

ACTION

- ⇒ Control of bleeding by local compression, elevation or packing
- ⇒ Anti-shock measures
- ⇒ ECG monitoring.
- ⇒ CPR for cardiac arrest.







D Disability

- Common causes of neurological deficits related to trauma are → Head injury, hypoxia, shock , alcohol or drug abuse

E. Exposure & Environment

- Clothes of the trauma victim are removed using a sharp large scissors.
- Warmth using blankets to prevent hypothermia.

2- Initial examinations & 2ry survey

- The secondary survey is to be done after resuscitation
- It includes examination of \Im
- 1- Vital signs : pulse, B.P & respiratory rate.
- 2- Chest & abdomen for associated injuries.
- **3- Scalp** for any scalp wound or hematoma.
- 4- Skull for any fracture.
- 5- Pupils & limbs.

Then Glasgow Coma Scale (G.C.S) Which based on ₹→

(1) Eye opening		
Spontaneous	4	
To verbal command	3	
To pain	2	
None	1	

(2) Best verbal response	
Oriented	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
None	1

(3) Best motor response		
Obeys command	6	
Localizes pain	5	
Flexion withdrawal	4	
Abnormal flexion	3	
Abnormal extension	2	
None	1	

Finally :

Total points are added, the higher the score, the better the prognosis [A score < 8] = poor prognosis

3- Performance of the necessary investigations

1- Plain skull x-ray :

- ① Can demonstrate the site & type of skull fracture
- ^② Can visualize foreign bodies.

2- CT scan It can diagnose :

- ① Fractures of the vault or base of skull.
- ^② Brain contusion or laceration.
- ③ Brain edema.
- ④ Intracranial hematomas.

4- Continuing care & observations

1- Posture :

- ① Unconscious : nursed on his side.
- \bigcirc **Conscious :** semi-sitting to \downarrow brain congestion & C.S.F. leak.
- 2- Pyrexia : Controlled by cold fomentation + antipyretics.
- 3- Breathing : Proper clear air way + oxygenation by P
 - ① Oxygen mask.
 - ^② Tracheostomy.
 - ③ Endotracheal tube + mechanical ventilation.
- 4- Bladder : Foley's catheter is fixed.

5- Bowel :

- ① Ryle's tube : for feeding in comatosed patient.
- ② **Rectal enema :** to evacuate the large bowel in comatosed patient.
- 6- Back :

Bed sores are prevented by changing the position of comatosed patient every 2 hours or using air mattress

5- Possible need for surgery To evacuate an intra-cranial hematoma

ANESTHESIA General anesthesia.

POSITION Supine position with head slightly raised to reduce venous congestion

INCISION Craniotomy (4 or 5 burr holes are done & connected by a saw).

STEPS

1- If depressed fracture vault is present

Elevation of depressed bone by bone elevator
 + deal with any intra-cranial injury.

2- If an extradural hematoma is present

⇒ If middle meningeal artery :

- At foramen spinosum : Bleeding control by a plug.
- Within the dura : Under running suture.
- At bony tunnel : Bone wax or crushing the bony canal over the vessel.



⇒ If venous sinuses :

• Suture the tear in the sinus wall

3- If a acute subdural hematoma is present

• The dura mater is opened in **cruiciate fashion** to allow rapid decompression of the brain.
Neurological disorders

I - CONGENITAL DISEASE

Spina bifida

DEFINITION

Congenital absence of posterior **neural arch** of the vertebrae

SITE

Most common at lumbo-sacral

TYPES

I- Spinal bifida occulta (10 %)

The defect in spine & lamina only, there is dimpling in the skin over it with tuff of hair & dilated veins.

II- Spina bifida manifesta (90 %)

1- Meningocele :

- **Definition :** Protrusion of meninges through lumbar defect.
- C/P : No paralytic lesion & hydrocephalus is common.
- Diagnosis : Cystic translucent mass.

2- Meningomyelocele :

- Definition : Protrusion of meninges & cord through lumbar defect.
- C/P : Paralytic lesion & hydrocephalus is rare.
- Diagnosis : Cystic transopaque mass.

3- Myelocele

4- Syringomyelocele

DIAGNOSIS (X-ray)

TREATMENT

1. Excision with repair of the defect To avoid rupture of meningitis.

2. Shunt operations

If hydrocephalus is developed.













Very rare

II- HYDROCEPHALUS

DEFINITION

It is an increase in the volume & pressure of C.S.F i.e. **Watery** head.

CLASSIFICATION

A- Non-communicating

It results from lesions that obstruct the ventricular system either at the aqueduct or basal foramina.

B- Communicating

It results from lesions that obstruct the subarachnoid space.

AETIOLOGY

1. Aqueduct occlusion :

This is the result of true aqueduct stenosis.

2. Arnold Chiari malformation :

Hydrocephalus is associated with myelomeningocele.

3. Dandy-Walker syndrome :

A cystic dilatation of the fourth ventricle obstructs CSF flow.

- 4. Cerebral malformations as hydrancephaly.
- 5. Arachnoid cysts that obstruct the CSF flow.
- 6. Neoplasms that are mainly situated in fourth ventricle

DIAGNOSIS

A- In children

- **Symptoms :** The mother says that the head of her baby is large & increasing in size.
- **Signs** : Circumference of Head > Normal.

B- In adult

- Acute type : Headache, vomiting, drowsiness & papillodema.
- Chronic type : Memory loss, urinary incontinence & disturbed gait.

INVESTIGATIONS

- 1- Plain x-ray
- 2- C.T scan
- 3- MRI

TREATMENT

Shunting procedures

Extra-cranial shunt :

e.g. (1) Ventriculo-peritoneal shunt.

(2) Ventriculo-atreal shunt.





Ventricles fill with fluid, pushing the brain outward



Normal

III - INTRA-CRANIAL ABSCESS

Brain abscess

AETIOLOGY

(Routes of infection)

- ① Local extension from adjacent infection e.g. Otitis media & sinusitis.
- ② Direct inoculation e.g. trauma.
- 3 Hematogenous.

PATHOLOGY

The abscess passes into 3 stages :

- ① Acute stage : Acute encephalitis with swelling & edema of the affected part.
 No pus is formed at his stage.
- ② Subacute stage : Pus is formed & It gets localized.
- ③ Chronic stage : Thick wall with pus inside.

CLINICAL PICTURE

A. Acute abscess will present with

- a. Picture of increased intracranial tension.
- **b.** Picture of infection & toxemia.
- c. Progressive headache resist to analgesics.

B. Chronic abscess will present with

- a. Picture of increased intracranial tension.
- b. Focal signs of brain lesions according to the lobe affected.

INVESTIGATIONS

- 1- C.T scan
- 2- MRI

TREATMENT

A- Medical treatment

- 1- Antibiotics.
- 2- Corticosteroids : reduce cerebral edema.

B- Surgical treatment

1- Factors that favour aspiration :

- ① Multiple abscesses.
- $\ensuremath{@}$ Deeply seated abscesses.
- ③ At critical site e.g. motor or speech area.

2- Factors that favour excision :

- ① Multi-locular abscesses.
- ② Superficial seated abscess.
- ③ Presence of foreign bodies.





IV-INTRA-CRANIAL TUMORS

DEFINITION

Intra-cranial tumors are refers to all neoplasms arising from the skull, meninges, blood vessels, pituitary, cranial nerves & brain tissue

INCIDENCE

50 % of Brain tumors are metastases **20 %** of all childhood neoplasms.

AETIOLOGY

Brain tumors are a result of **genetic alteration** which is mainly spontaneous however radiation, chemical & viral agents have been accused.

PATHOLOGY

Glial tissue	Glioma
Meninges	Meningioma
Nerves	Neuronal
	(e.g. Acoustic neuroma)
Blood vessels	Hemangioblastoma
Embryonic	Medulloblastoma
Embryonic Pituitary gland	Medulloblastoma Pituitary adenoma
Embryonic Pituitary gland	Medulloblastoma Pituitary adenoma - Non functioning
Embryonic Pituitary gland	Medulloblastoma Pituitary adenoma - Non functioning - Functioning

CLINICAL PICTURE

A- Symptoms due to \uparrow ICP

- Headache.
- Vomiting :
 - With or without nausea (projectile)
 - Not related to meals

Blurring of vision

due to papilloedema & later optic atrophy

B- Focal effects

RELATED TO THE SITE & NATURE OF THE TUMOR

- Hemiplegia in tumors of the motor areas
- Aphasia in tumors of speech area
- Hormonal disturbance in functioning pituitary tumors



Primary brain tumor

INVESTIGATIONS

1- CT scan without & with contrast

- ① Detects the site & size of the tumor
- ② Detects the presence of edema
- ③ Detects midline shift
- ④ Detects the presence of hydrocephalus
- ⑤ Points to the pathology as Solid, cystic, calcification....etc.

2- MRI

Becomes **the best tool in diagnosis** especially when used together with CT scan

3- Less used investigations As plain x-ray or angiography

TREATMENT

A- Medical treatment

- 1- Dehydration measures (diuretics) as mannitol to control edema & to ↓ I.C.P
- 2. Steroids in treatment of pre & post-operative edema
- 3. Chemotherapy in specific tumors.

B- Surgical treatment

- 1. Craniotomy through bone flaps
- 2. Craniectomy by bone nibbler used in regions covered by muscles e.g. Sub-occipital region
- 3. Ventriculo-peritoneal shunt may be needed if associated hydrocephalus



4. Endoscopic surgery for intra-ventricular tumors

C-Radiation

Radiotherapy for most malignant tumors



V- LUMBAR DISC PROLAPSE AETIOLOGY TRAUMA : Lifting heavy objects or excessive exercise Congenital : Weakness of supportive ligaments of the spine produces extra-strain on the disc. PATHOLOGY Site Disc between L₄ - L₅ or L₅ - S₁ Stages 1st STAGE : Softening & fragmentation of the posterior part of annulus fibrosus

2ND STAGE :

Prolapsed material (**nucleus pulposus**) presses on the roots leading to sciatica or cauda equina.

3RD STAGES :

Prolapsed material becomes fibrotic with more injury to spinal cord.



CLINICAL PICTURE

History Sudden strain followed by low back pain.

Symptoms

- 1- Limping gait & lumbar scoliosis.
- 2- Sciatic pain : pain referred down to one or both leg.

Signs

- 1- Flexion of the spine or raising straight leg \rightarrow 11 pain.
- 2- **Sensory changes :** 1st parathesia then sensory loss.
- 3- Motor changes : wasting or paralysis.

D.D From SPINAL TUMORS

or **POTT'S DISEASE** of spine.

INVESTIGATIONS

MR! or **Mylography**

TREATMENT

A- Conservative treatment Rest in bed, analgesics, anti-rheumatics & physiotherapy.

B. Epi-dural injection

Injection of **Novocain** & **Corticosteroids** may relief pain.

C. Surgical treatment

1- LAMINECTOMY : Open surgery or endoscopic i.e. removal of prolapsed disc.

2- SPINAL FIXATION BY PLATE & SCREWS

If multiple level discs to be removed



Removal of lamina







Vertebrae Spinal cord -

ANESTHESIA



Assessments

I- PRE-OPERATIVE ASSESSMENT

THE PROCESS OF PREOPERATIVE ASSESSMENT IS DONE IN 3 STEPS

1- Outpatient clinic

- Assessment of fitness for operation

- 1. Fitness for anesthesia : search for \Im
 - ① Diseases increasing the risk for anesthesia.
 - ⁽²⁾ Use of drugs as steroids, anticoagulant, bronchodilators, antibiotics, and psychotropic agents, contraceptive pills

2. Previous operations & anesthetics

3. Allergy & hypersensitivity

① Sensitivity to penicillin or iodine-containing substances
② Any complications particularly chest, cardiac or renal

4. Alcohol & drug abuse

5. Smoking

- Physical examination This will include :

A. General metabolic status

e.g. Malnourished patients

B. Respiratory system

The preoperative risk factors include the following P→

- ① Thoracic & upper abdominal surgery
- ② History of COPD
- ③ History of cigarette smoking
- ④ Symptoms of respiratory disease
- S Abnormal findings on chest radiographs

C. Cardio-vascular system

- a. The presence of congestive heart failure, unstable angina, or recent myocardial infarction requires a cardiac workup before an elective operation
- b. Most patients require echocardiography to determine whether coronary ischemia is reversible.

D. Urinary system

- ① Urine analysis : for sugar, ketones, bilirubinetc.
- 2 plasma urea & creatinine

E. Hepatic system

All jaundiced patients & those of a previous history of liver disease, hepatomegaly, splenomegaly, or high alcohol intake requires \Im

- Tests of liver function,
- Tests for circulating hepatitis B & C

F. Neurological system

Patients who are at high risk, such as those with carotid bruits or cardiovascular disease,

- UIS of the carotid arteries to check for stenosis

2- Admission to hospital

On arrival to hospital

- The surgeon checks that the patient notes are complete, result of investigations received.

3- Preoperative round

Done on the day before surgery

⇒ Final examination of the patient :

- Re-examine the patient to ensure finding & ensure that the proposed operation is correct.
- In cases of unilateral condition (hernia, varicose veins ...) the side should be marked.
- Blood should be prepared in case needed for transfusion.

⇒ Instruction to medical stuff :

- Urethral catheterization may be required if so, it should be delayed until patient anesthetized.

⇒ Discussion of the procedure :

- Surgeon should discuss the plan of the operation with his team

⇒ Instruction to nursing stuff :

- Administer the preoperative medication.
- Operation area has to be shaved immediately before surgery or after induction of anesthesia.

I - PRE-OPERATIVE PREPARATION



III - PRE-ANESTHETIC ASSESSMENT

PRE-ANETHETIC VISITOR INCLUDE

1- Full history :

About diabetes, hypertension, drugs to avoid interaction between drugs & anesthetic agents

2- Examination :

(Pulse. blood pressure & teeth to avoid miss of teeth).

3- Revision for investigations

IV-PRE-ANESTHETIC MEDICATIONS

- Types of pre-anesthetic medications

1- Sedation

Can be achieved by **Benzodiazepines** or **Opioids** (or both).

2- Analgesia

Can be achieved by IM Morphine or IV- Fentanyl

- These drugs may cause ₹
 - Nausea
 - Decrease gastric motility
 - Biliary spasm

3- Airway secretions/ heart rate

Can be achieved by Anticholenergics

4- Prevention of bronchospasm

Can be achieved by continuation of Anticholenergics

5- Decrease gastric acidity

Can be achieved by H₂ blocker as **Ranitidine** or proton pump blocker as **Omeprazole**

6- Decrease Nausea/Vomiting

Can be achieved by **Ondansetron** & avoid nitrous

7- Medications to be continued

• Cardiovascular medication :

- Such as calcium-channel blacker, beta-blacker, nitrates, and anti-arrhythmic agents should be continued

• Bronchodilator :

- Should be continued, as withdrawal can precipitate bronchospasm.

• Antiepileptic treatment

• Steroid intake:

- Sudden withdrawal causes Addison crises

• Aspirin :

 As it inhibits platelet function & is indicated in patients with a history of myocardial infarction and stroke.
 It should be continued unless major surgery

8- Medications to be stopped

• Anticoagulants as Warfarin

- Should be stopped at least 4 days before surgery, as these patients are at increased risk of bleeding.

• Contraceptive pills

- Increase the risk of thromboembolism by increasing the activity of clotting factors.
- The progesterone only pill need not be discontinued.

Drugs used in Anesthesia

DRUGS USED IN ANESTHESIA



I. Drugs used for induction of anesthesia

Intravenous induction agents

- Intravenous anesthetics are mainly used to provide rapid smooth induction of hypnosis.

- They may also be used as a continuous infusion to maintain anesthesia

So, when used for maintenance of anesthesia

Intravenous anesthetic agents are commonly supplemented with analgesics & muscle relaxants are required

Examples 🍣

1- Thiopental

2- Propofol (Diprivan)

3- Ketamine (Ketalar)

II. Drugs used for maintenance of anesthesia

Inhalation anesthesia

They are the most popular agent used for maintenance of Anesthesia when Intravenous access difficult e.g. in children or obese patient volatile anesthetic

Examples 🍣

1- Nitrous oxide

- 2- Halothane
- 3- Isoflurane

Halothane can be used for inhalational induction of anesthesia

	THIOPENTAL	PROPOFOL (DIPRIVAN)	Ketamine (Ketalar)		
CHEMISTRY	Barbiturates	Non Barbiturates	Non Barbiturates		
Administration	I.V & rectal	I.V	IV, oral, IM, nasal spray		
DURATION	Short	Very short	Moderate		
PROTECTIVE REFLEXES	Suppressed	Suppressed	May be preserved		
C.N.S					
• TIMING • ANALGESIC • RECOVERY • SIDE EFFECTS	Within 30 sec Weak Reasonable	Within 30 sec No Excellent	Immediately Potent Poor		
- NIGHT MARES - AMNESIA 1 HOUR - HALLUCINATION - I.C.T - I.O.P - MUSCLE TONE	No No ↓ ↓ ↓	No No ↓ ↓ ↓	+ve +ve +ve 1 1		
RESPIRATORY	Dep	ressed	Preserved		
C.V.S	-ve Inotropic↓ BP		• +ve Inotropic • ↑ BP		
G.I.T	Nausea & vomiting	Anti-emetic	↑ salivation		
HEPATO-RENAL	Transient ↓ of function	Transient ↓ of blood flow	No effect		
PAIN ON INJECTION	No	Common	No		
Соѕт	Cheap	Expensive	Cheap		
USES	 Treatment of status epilepticus 	 Induction of anesethia Maintenance of 	 Short procedures in pediatrics Analgesic & sedation 		
	② ↓ I.C.T	anesethia ^③ Sedation during endoscope ^④ Sedation in I.C.U			
SIDE EFFECT	HypotensionRespiratory depression		 Hypertension Tachycardia 		

	NITROUS OXIDE	HALOTHANE	ISOFLURANE
NATURE	Gas Volati		le liquid
ANALGESIC EFFECTS	Good	No	Weak
ANESTHETIC EFFECTS	Weak Po		otent
ONSET OF ACTION	Very fast	Moderate	Fast
RATE OF RECOVERY	Very fast	Moderate	Fast
Odor	No	Pleasant	Pungent
USE FOR INHALATION INDUCTION	Good		Unacceptable
MYOCARDIAL DEPRESSION	Minimal	Significant	Minimal
ARRHYTHMIAS	No	++++	No
VASODILATATION	No		+++
Нератотохісіту	No	May occur	No
BRONCHO- DILATATION	No	++++	+++
SKELETAL MUSCLE RELAXATION	No effect	Minimal effect	Potentiate muscle relaxants
Соѕт	Expensive	Cheap	Expensive

III. Post-operative pain control

INDICATIONS

- ① Comfort of patient
- ② Restore function
 - Normal breathing
 - Early movement

③ Decrease postoperative complications :

- D.V.T, pneumonia, lung collapseetc.

TIMING

Start before surgery ending

METHODS

I. Regional techniques

1. PERIPHERAL NERVE BLOCK

- a. Block of sensory nerve ending
 - *Topical :* Skin or mucus membrane
 - Infiltration : S.C injection
 - Local intra-venous : Lidocaine

b. Conduction anesthesia

- Peripheral nerve block : e.g. Ulnar nerve
- Plexus block : e.g. Brachial plexus

2. NEURO-AXIAL BLOCK : (EPIDURAL & SPINAL)

- Advantage :
 - Adequate long lasting analgesia without sensory loss.

Nerve root

block

Peripheral nerveblock

- Disadvantage :
 - Itching, nausea & vomiting

II. Parentral analgesics

W.H.O REGIMEN

FOR ACUTE POST-OPERATIVE PAIN OF CHRONIC CANCER PAIN

- 1. Mild pain : Non-opioid " N.S.A.I.D "
- 2. Moderate pain : *Short* acting opioids ± N.S.A.I.D

3. Severe pain : *Long* acting opioids ± *Short* acting opioids

± N.S.A.I.D

1. NSAIDS

• Mechanism of action :

↓ Inflammatory mediators at site of pain

- Route : Oral
- Advantages :

No respiratory depression **No** nausea & vomiting

Contraindications :

- Bronchial asthma
- Renal failure
- Liver dysfunction
- Peptic ulcer

2. ORAL OPIOIDS Tramadol (Tramal)

- Route : Oral preparation. I.M or I.V
- Advantages :
 - Given orally i.e. simple administration
 - Cheap
 - The main method for ambulatory pain management
 - As potent as N.S.A.I.D injection
- Disadvantages : Slight delayed onset

3. INTERMITTENT OPIOIDS Morphine & Pethidine

- Route : IM
- The most popular method
- Disadvantages :
 - Painful
 - Delayed onset affection
 - If overdose \rightarrow respiratory center suppression

4. I.V. OPIOIDS Morphine & Pethidine

Choice of parentral :

	Contraindications
Morphine	Hepatic dysfunction
Pethidine	Renal impairment

• Dosage of opioids :

" Variable response of patients"

• Starting dose :

1 mg/kg **Pethidine** or 0.1 mg/kg **Morphine**

Then the dose titrated to optimize analgesia to decrease side effects.

Especially in extremes of age or bad general conditions

Types of Anesthesia

TYPES OF ANESTHESIA

I - GENERAL ANESTHESIA

General anesthesia entails loss of consciousness, analgesia and muscle relaxation. It entails 3 phases : Induction, maintenance and recovery

Hazards & complications of general anesthesia

- 1. Fire & explosions
- 2. Neurological complications.
- 3. Cardiovascular complications.
- 4. Respiratory complications.
- 5. Vomiting & regurgitation.



1-FIRES & EXPLOSIONS

due to the presence of inflammable anesthetic agent as **Ether**, **Cyclopropane** or **Ethyl chloride** plus a source of ignition as an electric spark, e.g. **The diathermy**.

2-NEUROLOGICAL COMPLICATIONS

[1] Cerebral hypoxia

CAUSES

- **Hypoxic hypoxia** due to reduced O₂ percentage in inhaled anesthetic mixture or respiratory obstruction.
- Diffusion hypoxia as in pulmonary edema.
- Stagnant hypoxia in peripheral circulatory failure.
- Histotoxic hypoxia due to drug poisoning.

CLINICAL PICTURE

- Mild cerebral hypoxia leads to delay in recovery of consciousness.
- Severe hypoxia can cause cerebral damage & coma.

TREATMENT

- Ventilation.
- Combat cerebral edema by giving dehydrating measures as Mannitol
- Hypothermia.

[2] Peripheral nerve palsy

CAUSES

• Over stretching due to mal-positioning especially of the upper limb leading to brachial plexus palsy.

• Compression by the sharp edge of the operating table causing ulnar or lateral popliteal nerve palsy.

[3] Convulsions may occur

Especially in children due to hyperthermia from premedication with **atropine** or use of **ether** anesthesia.

3- CARDIOVASCULAR COMPLICATIONS

[1] Hypertension may be due to P>

- Light plane of anesthesia & inadequate analgesia.
- Hypercarbia (1CO₂ in blood).
 Some muscle relaxants as Gallamine or Pavilon, or anesthetics as Ketamine, or Cyclopropane.
- Undiagnosed pheochromocytoma or Co-arcitation of the aorta.

[2] Hypotension may be due to \Im

- Some anaesthetic drugs may cause hypotension.
- Late stages of hypoxia & hypercapnea.
- Hypovolemia.
- Excessive positive pressure ventilation decreases the venous return leading to hypotension.
- Extreme bradycardia.

[3] Cardiac dysrythmias (Any type can occur)

The main causes are \Rightarrow

- Halogenated anesthetics sensitize the myocardium to the action of circulating catecholamines.
- Hypoxia, Hypercarbia & hypotension.
- Surgical manipulation especially during open heart, or gall bladder surgery.
- Electrolyte imbalance.
- Endocrine disorders as in thyrotoxicosis.

[4] Circulatory arrest = (Cardiac arrest)

See 1^{ry} cardiac arrest & its management.

[5] Pulmonary and systemic embolism

4- RESPIRATORY COMPLICATIONS

Cyanosis under general anesthesia

CAUSES

- **1- RESPIRATORY OBSTRUCTION MY OCCUR AT ANY OF** THE FOLLOWING SITES :
 - Pharynx : Due to backward falling of the tongue during recovery due to relaxation of the jaw.

It is treated by holding the jaw forwards and insertion of an oro-pharyngeal airway.

Larynx : Due to laryngeal spasm. The precipitating factors include irritant anaesthetic vapors, extubation, presence of secretions & vomiting.

It is treated by oxygenation under pressure

> The trachea & bronchi :

Due to profuse secretions, sputum, foreign body, vomiting or kinking of the tube.

It is treated by proper suction & oxygenation.

> Alveoli : *Due to* pulmonary edema 2^{ry} to heart failure.

N.B: Signs of respiratory obstruction :

⇒ With spontaneous respiration :

Noisy breathing, absent breath sounds, \downarrow chest movement with forced expiration

⇒ With controlled respiration : increased pressure to inflate the lungs (i.e Resistance to inflate the lungs).

2- RESPIRATORY DEPRESSION MAY OCCUR DUE TO :

- Depression of the respiratory centre by narcotics & analgesics.
- **Incomplete recovery** of the respiratory muscle from the effects of muscle relaxants.
- Metabolic disorders as uremia & diabetes mellitus.
- Hypothermia.

TREATMENT

A- PROPHYLACTIC :

- ① Maintain a free airway by an endotracheal tube.
- ② Enough O₂ to support the patient.
- ③ Avoid over dose of premedications or anesthetics.

B- CURATIVE :

- ① Remove the cause
- 2 Ventilate with O2 until cyanosis disappear

5- VOMITING & REGURGITATION

Regurgitation is a passive process due to muscle relaxation.

Vomiting may occur during recovery from anesthesia.

PREDISPOSING FACTORS

- ① Full stomach.
- ② Increased intra abdominal pressure due to abdominal distention, ascites or tumors.
- ③ Intra-abdominal manipulations during surgery.

SEQUELAE

- ① If mild it will lead to laryngeal spasm.
- ② If severe it may cause severe hypoxia & cardiac arrest.
- ③ Late pulmonary infective complications.

PREVENTIVE MEASURES

- ① The patient should have an **empty** stomach by fasting for **6** hours before elective operations.
 - In Emergency situations :

a large stomach Ryle tube is passed before induction.

- ② Inhalational anesthetics used for induction may cause vomiting and should be avoided if there is a possibility of vomiting.
- ③ An endotracheal tube should always be used to protect the airway from possible vomits.



④ During recovery

a strong sucker is ready and the head is lowered so that no gastric contents can reach the airway.

TREATMENT

IF VOMITING OCCURS

THE FOLLOWING STEPS SHOULD BE PERFORMED $\stackrel{\mathcal{D}}{\rightarrow}$

- Lower the head of the table.
- Good suction.
- Oxygenation.
- IV hydrocortisone.
- Antibiotics are administered.
- Bronchoscopy if necessary.



II - LOCAL (REGIONAL) ANALGESIA

TYPES OF LOCAL ANALGESIA

1- Surface analgesia

By local anaesthetic spray, or cream. It is used for mucous membranes as the mouth, pharynx, larynx or urethra.

2- Local infiltration analgesia

This entails local injection of the anaesthetic in the subcutaneous tissue to block the sensation in a localized area or to produce field block.

3- Nerve block

This means local injection of the anaesthetic in the neural sheath around a peripheral nerve.

4- Plexus block

This is performed by injection of the local anaesthetic in the neural sheath around the nerve plexus (brachial plexus or lumbar plexus).

5- Nerve root block

The local anaesthetic is injected either in the epidural space or in the subarachnoid space.

6- Local intravenous analgesia

It is used in the extremities after application of a tourniquet.

CONTRAINDICATIONS TO LOCAL ANALGESIA

- ① In children under 10 years.
- ② In psychotics.
- Non co-operative patients.

COMPLICATIONS OF LOCAL ANALGESIA

1- Complications due to the technique

① Intra vascular injection.② Injury to adjacent nerves or blood vessel.

2- Complications due to local anesthetics

- ① Central nervous system : stimulation followed by depression .
- 2 Cardiovascular system : Hypotension
- ③ Respiratory depression may progress to apnea due to medullary depression or respiratory muscle paralysis.
- ④ Allergic reactions lead to bronchospasm, urticaria & skin rash.

3- Complications due to combind Adrenaline with local anaesthesia

- Marked tachycardia, hypertension & heart failure if suddenly absorbed in vascular areas.
- ② If used for ring block as in fingers, toes & penis, gangrene may result.





III - SPINAL ANESTHESIA

- ① It is simple & easy to be performed.
- ② It gives adequate muscular relaxation.
- ③ It reduces bleeding (induced hypotension).
- ④ It does not interfere with cardiac, hepatic or renal functions.

CONTRAINDICATIONS TO SPINAL ANESTHESIA

- ① Local sepsis in the lumbar region
- ② Deformities of the spine as kyphosis.
- ③ Previous operations in the lumbar spine region e.g. laminectomy operation.
- CNS diseases such as disseminated sclerosis
 & progressive muscle atrophy
- **⑤** Patient refusal.
- © Extremes of age as very young or very old patients.
- ⑦ Neurological or psychological disturbances for medico-legal causes.
- **®** Patients receiving anti-coagulants.

MECHANISM OF SPINAL ANESETHIA

The position

- 1- The patient is usually positioned in a sitting posture on the operating table.
- 2- The forearms can be made to rest on thighs to make the patient stable & comfortable,
- 3 Alternatively procedure can be performed with the patient lying on his side with his hips and knees are maximally flexed.

The procedure

- 1- The anesthetist will clean the back using anti-septic solution .
- 2- He may administer a little bit of local anesethia to numb the skin over the point where the spinal anesethia will be given as the spinal needle may produce some pain
- 3- The anesthetic solution is then injected through the needle into the spinal space usually between $L_3 \& L_4$ but may vary from patient to another
- 4- After successful administration, the patient will be positioned as required & all his parameters will be checked by the anesthetist .





COMPLICATIONS OF SPINAL ANESTHESIA

1. Early complications

1- VASO-VAGAL ATTACK :

⇒ Fainting, sweating, hypotension and bradycardia in sensitive patients.

TREATMENT

- ① Reassurance.
- ^② Putting the patient in the recumbent position + I.M. Atropine.

2- FAILURE OF SPINAL ANESTHESIA.

3- SENSITIVITY TO DRUGS:

⇒ Leads to convulsion + severe cardio-respiratory depression.

TREATMENT

- Proper ventilation by O₂ mask or even endotracheal tube
 + mechanical ventilation.
- ^② Support the cardiovascular system is vital.

4- SPINAL SHOCK :

AETIOLOGY This is due to 🏷

- ① ↓↓ venous return as a result of peripheral pooling of blood in the dilated blood vessels below the level of spinal block,
- ② Loss of muscle tone \rightarrow peripheral stagnation of blood.

CLINICALLY

Sweating, bradycardia, hypotension, nausea & vomiting, CNS irritability and chest tightness.

EARLY DETECTION

A.B.P should be monitored every 5 minutes during the 1st 20 minutes during spinal anesthesia.

TREATMENT

- ① Immediate trendlenburg's position to ensure adequate blood supply to the brain & heart.
- ② **Oxygen** inhalation.
- ③ Vasopressor drugs as Ephedrine 25 mg slowly by I.V. drip.
- ④ Atropine 0.2mg I.V.
- **⑤ I.V. fluids** up to 2 litres of ringer's lactate.

5- TOTAL SPINAL ANESTHESIA :

This occurs when the anaesthetic drug travels high up in the subarachnoid space leads to paralysis of intercostals muscles & diaphragm leads to APNEA.

TREATMENT

Endotracheal intubation + respiratory support

6- NAUSEA & VOMITING may be due to 🗞

⇒ Hypotension, hypoxia or surgical traction on the mesentery of intestine.

TREATMENT

- ① Correction of the cause.
- ② Anti-emetic is given.

7- SHOOTING PAIN IN THE LEG

 \Rightarrow Due to touching of one of nerve roots by the spinal needle.

8- SUDDEN DEATH :

 \Rightarrow Rarely occurs when a thick needle is used \rightarrow sudden drop of C.S.F. pressure \rightarrow brain stem conization at the foramen magnum.

2. Late complications

1- POST - SPINAL HEADACHE :

This is the commonest complication occurring during the 1st 2 - 3 days following spinal anesthesia.

⇒ There are 2 types :

A. Hypotensive headache

- Due to dural puncture by thick needle or multiple punctures
 → C.S.F. leak → ↓↓ pressure.
- The patient gets severe headache on raising his head, while he gets relief by lying flat.

TREATMENT

- Analgesics, high salt & fluid intake + I.V. saline.

B. Hypertensive headache Rare

- Due to chemical irritation by anaesthetic drugs → ↑↑ production of C.S.F.
- Headache is increased by lying flat & relieved some what by sitting.

TREATMENT

- Analgesics

2- MENINGITIS :

⇒ Fever, severe headache, neck rigidity. lumbar puncture is diagnostic.

TREATMENT

- Antibiotics + analgesics.

3- BACKACHE due to traumatic lumbar puncture.

4- NERVE PARALYSIS : due to ₹

- ① Cauda equina lesion.
- 2 Paraplegia.

5- ACUTE URINE RETENTION :

It occurs in the 1^{st} 24 hours post-operative due to prolonged paralysis of S_2 , S_3 nerves.

تحدير

هذا الكتاب مسجل ومحفوظ بدار الكتب والوثائق القومية

المؤلف ودار الكتاب الجامعي

هو الناشر والموزع الوحيد