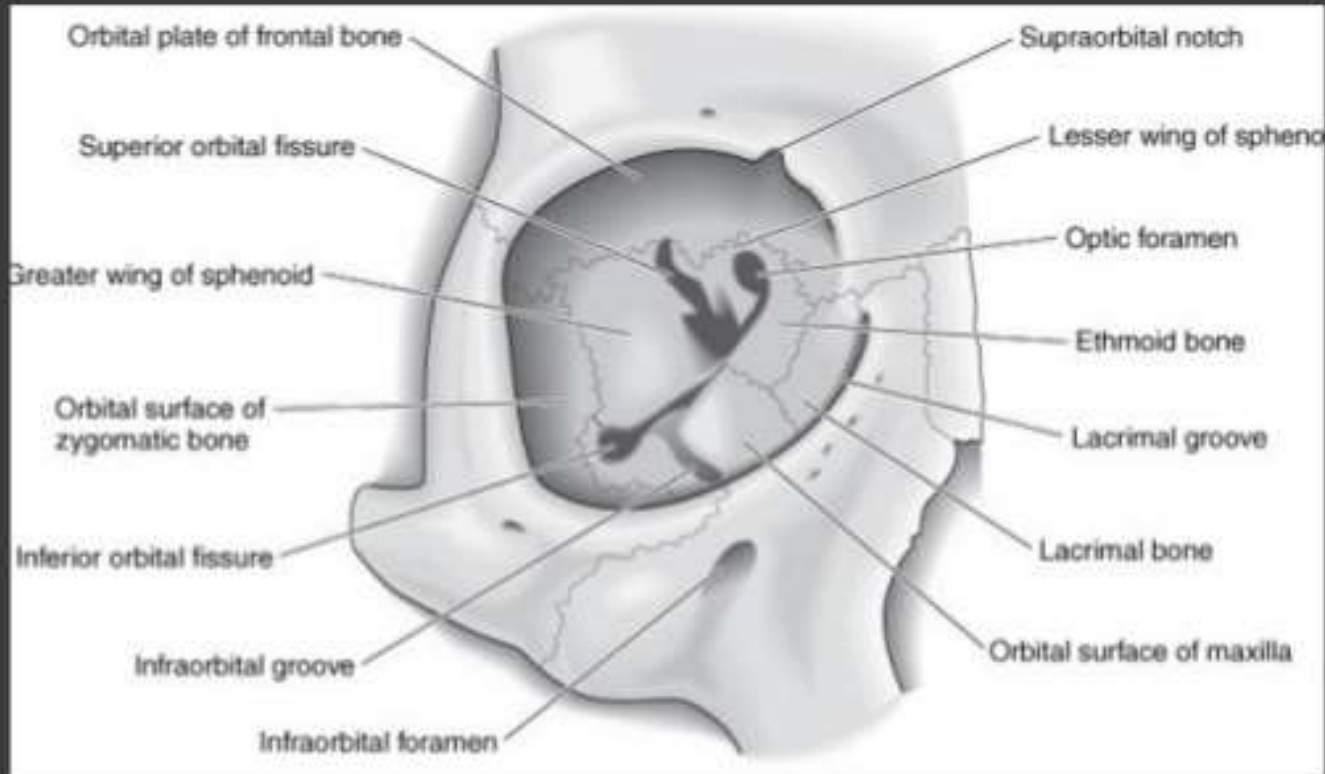


# Orbit

Dr Vibhavari Barhate

Dept Of Ophthalmology

# Bones of Orbit



Frontal  
Lacrimal  
Maxillary

Ethmoid  
Palatine  
Zygomatic

Sphenoid

## ● Lateral wall

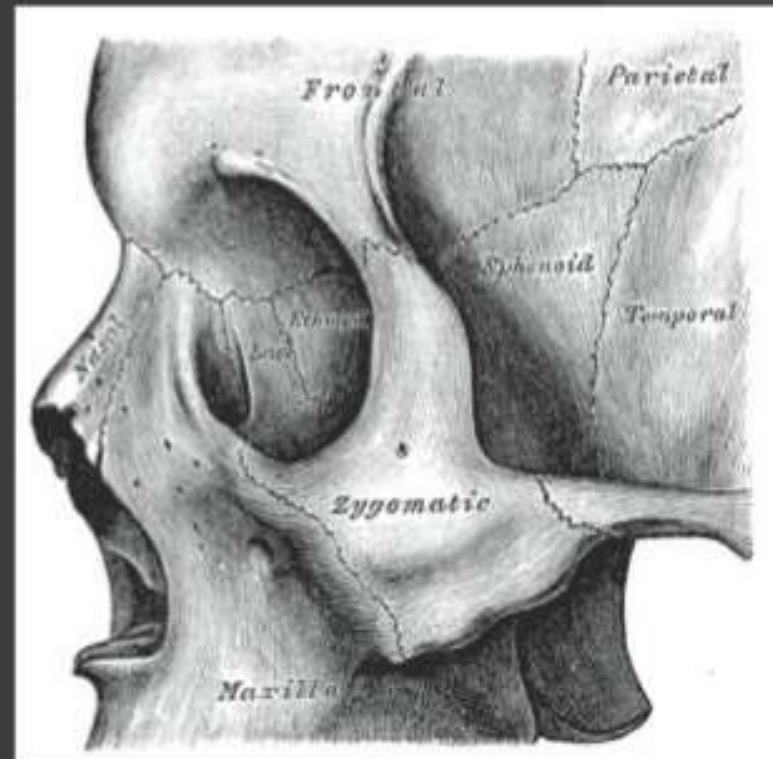
Greater wing –sphenoid

Orbital surface –

Frontal process of zygomatic

Inferiorly – inf orbital fissure

Medially – sup orbital fissure



## ⦿ Floor of orbit

Maxilla

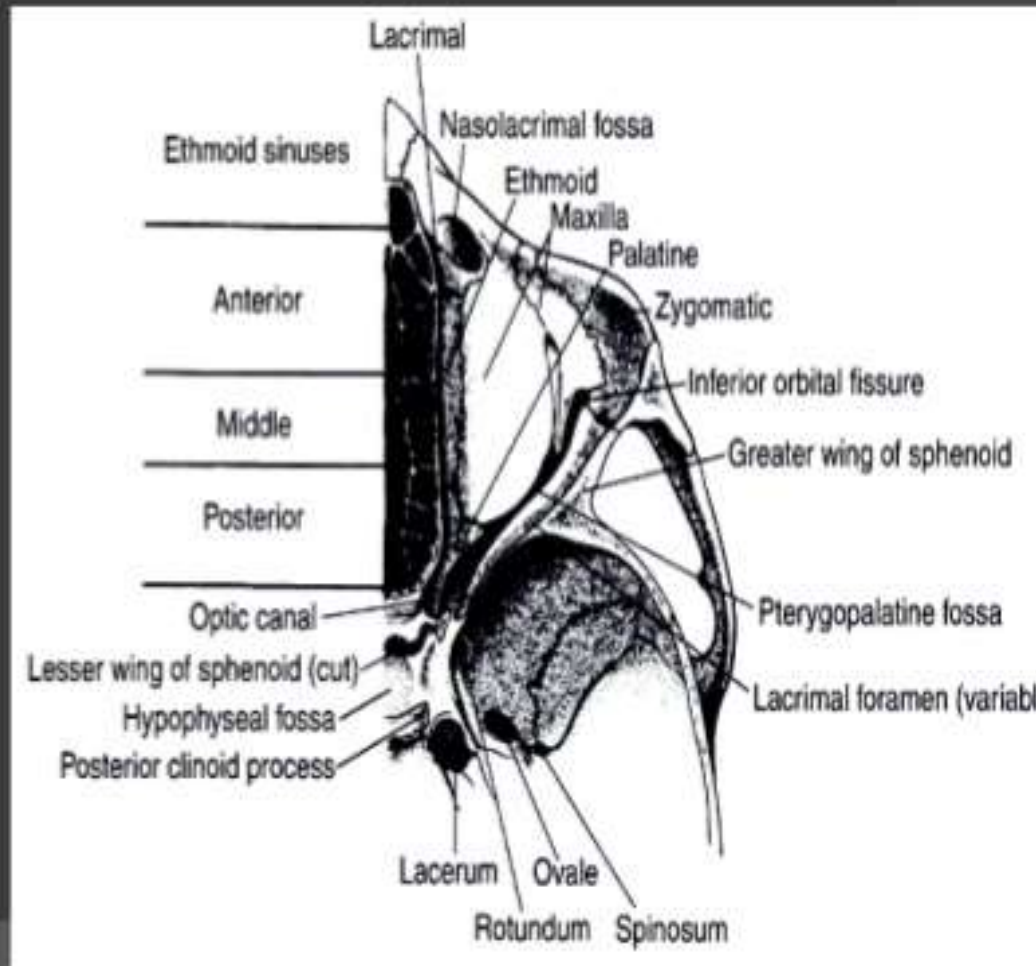
Zygomatic

Palatine

Triangular segment

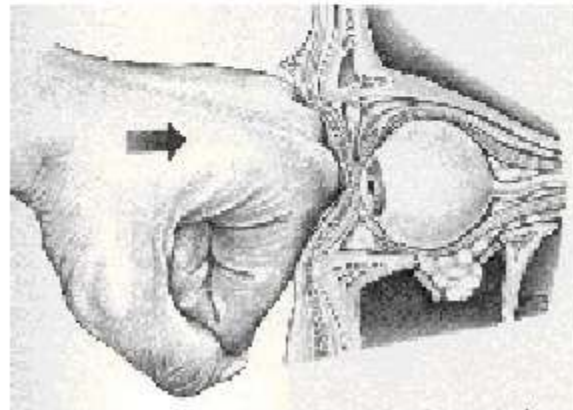
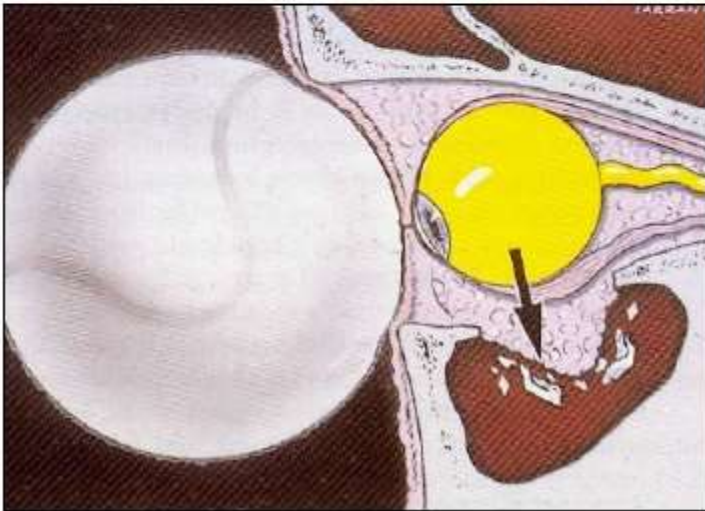
-- thinnest

Inferior orbital groove



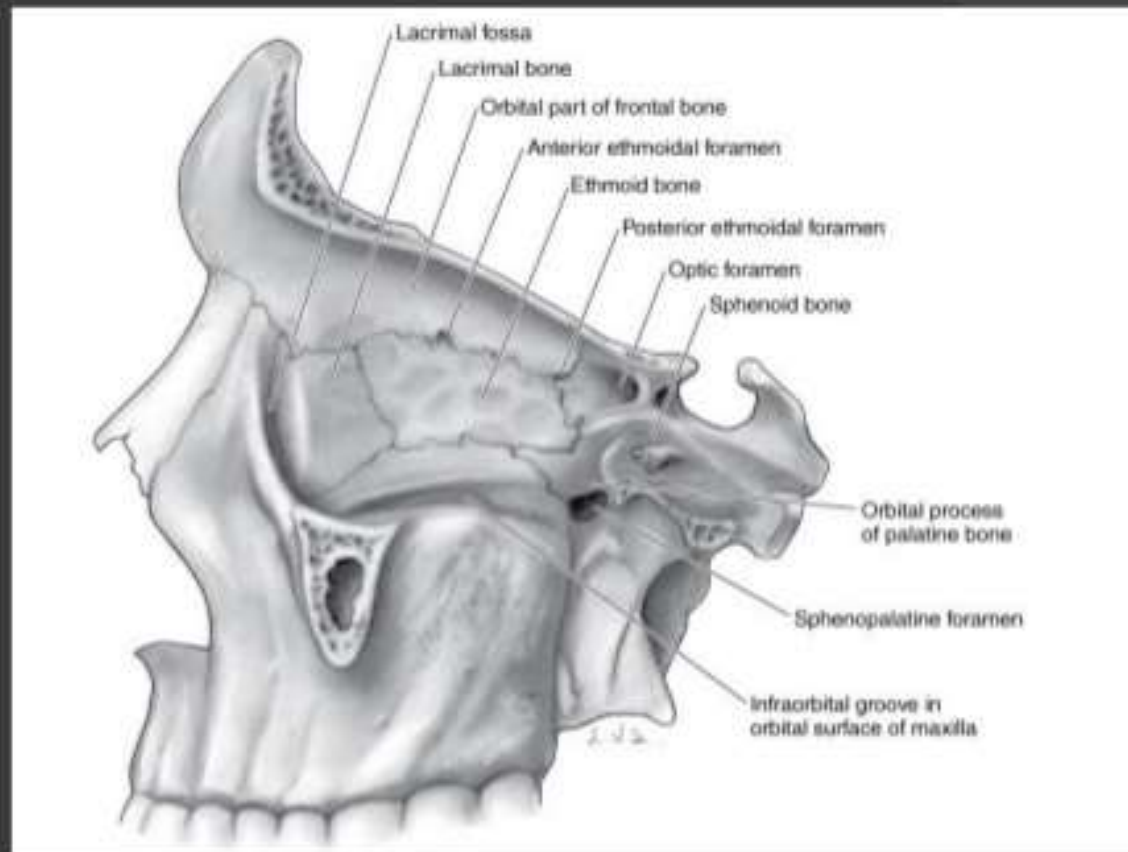
# Theories of Blow-Out Fracture

- **Direct injury (Retropulsion):**
  - ▣ Sudden compression of globe with orbital floor fracture (increased orbital & ocular pressure)
- **Indirect injury (Buckling)**
  - ▣ Blow to inferior rim causes a ripple effect causing fracture



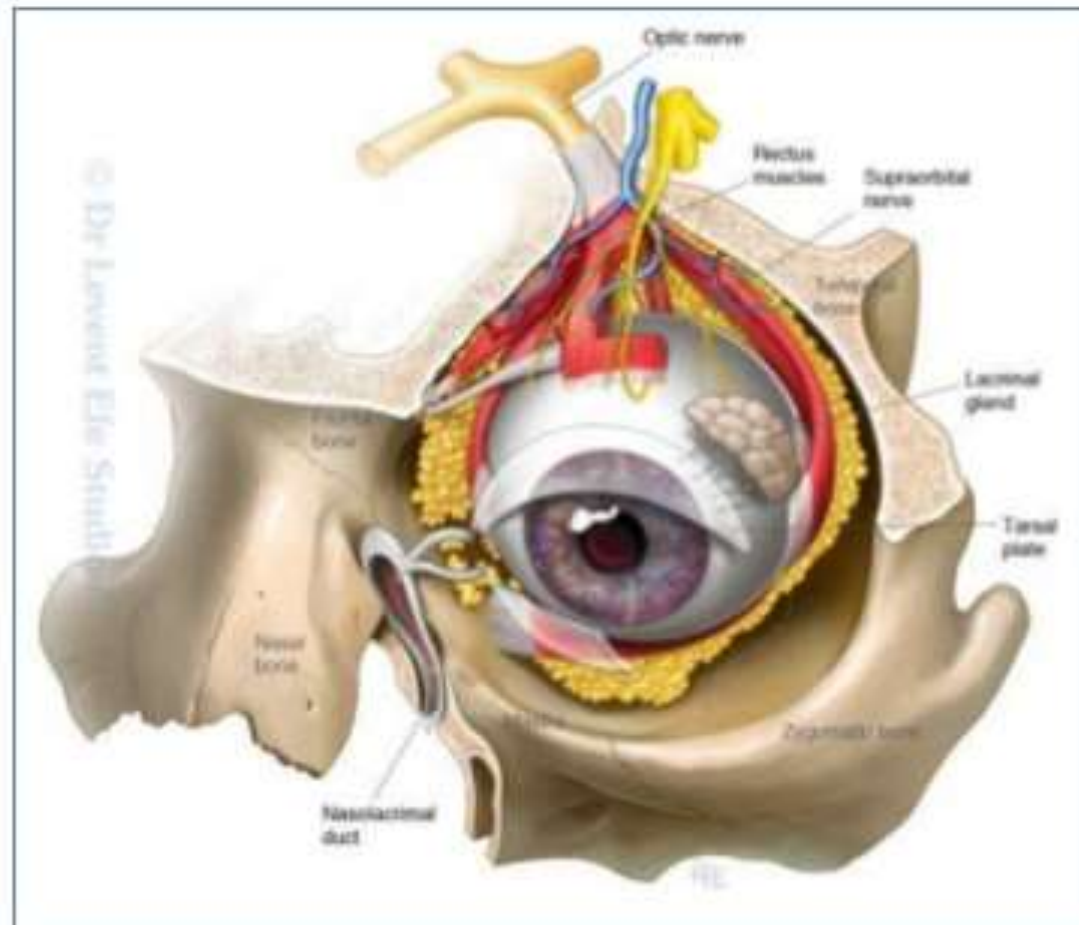
## Medial wall

Body of sphenoid  
Ethmoid  
Lacrimal  
Maxilla[frontal  
process]

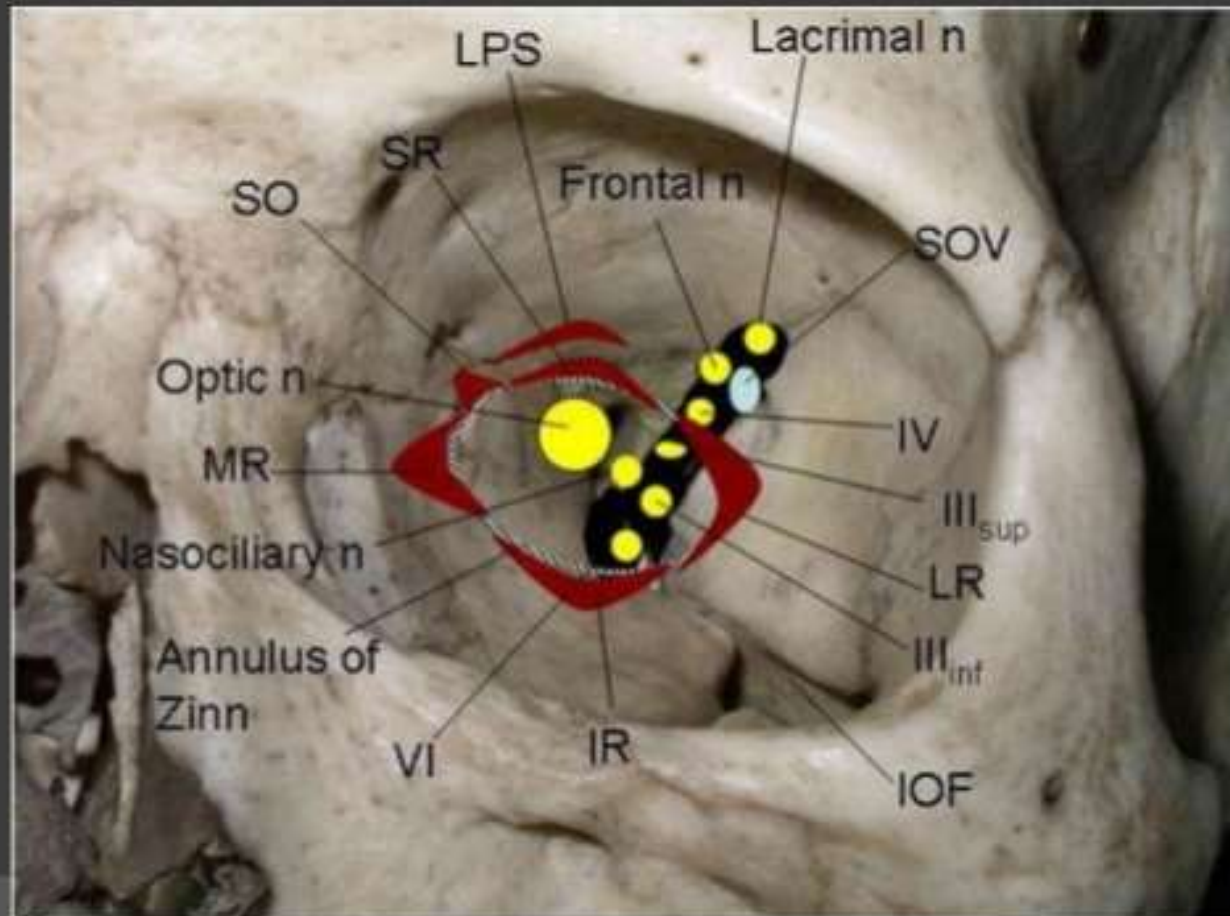


# Orbital contents

- The eye balls,
- extra ocular muscles,
- nerves,
- vessels,
- fat,
- and most of the lacrimal apparatus
- with the optic nerve as its stem
- Volume: 30 cc



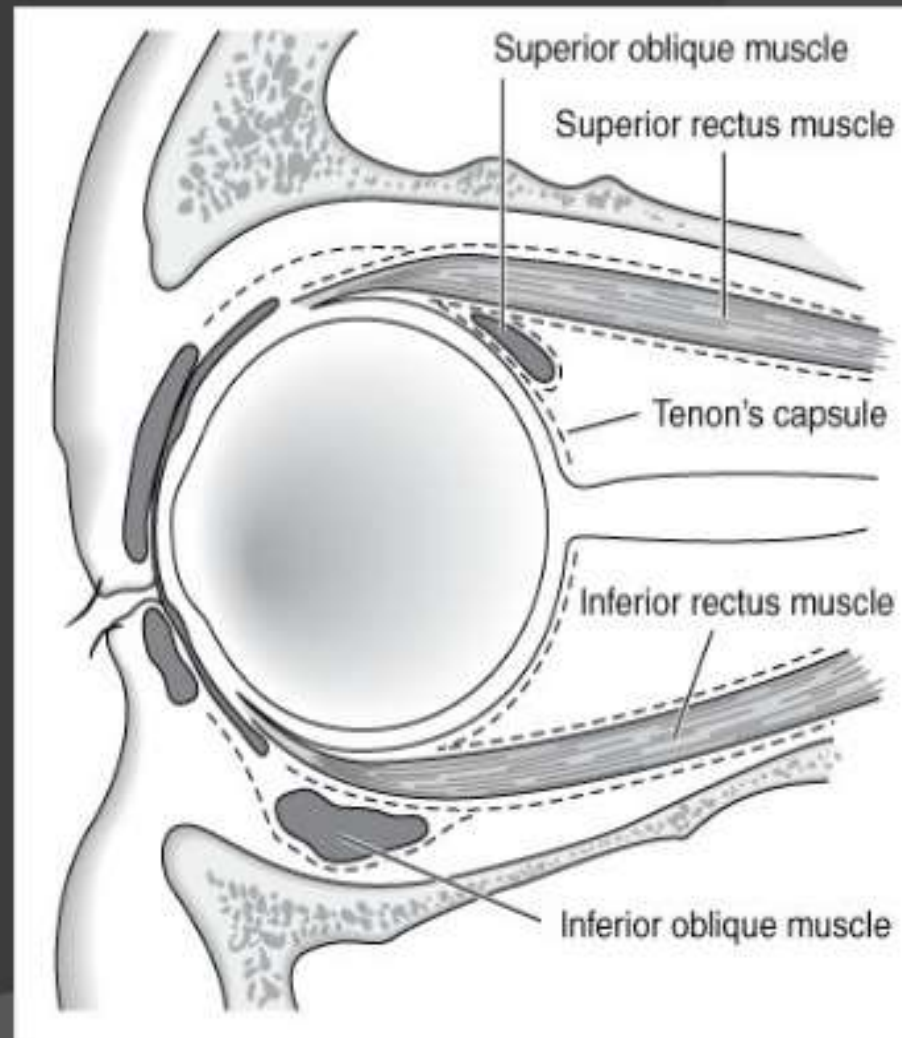
## ● Orbital apex





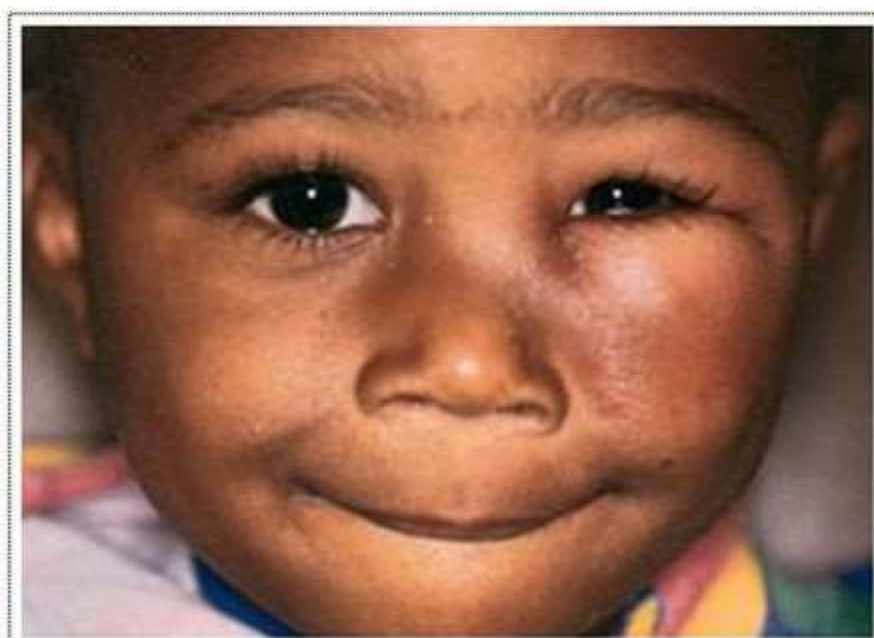
# Surgical spaces in orbit :

- Sub periosteal space
- Peripheral space
- Central space
- Tenon's space



# Disorders of the Orbit- infections

- Pre-septal Cellulitis (Periorbital cellulitis)
- Post-septal Cellulitis (Orbital cellulitis)



Source: Knop KJ, Stack LB, Storrow AB, Thurman RJ: *The Atlas of Emergency Medicine, 3rd Edition*: <http://www.accessmedicine.com>  
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**Periorbital cellulitis (note normal conjunctiva)**



**Orbital Cellulitis (markedly erythematous conjunctiva)**

# Preseptal cellulitis

## Symptoms & signs:

- ❖ Swelling, erythema, chemosis of lids
- ❖ Conjunctival discharge
- ❖ No proptosis, ocular movements
- ❖ Vision not affected

## Treatment:

- ❖ Antibiotics, NSAID



# Orbital cellulitis

**Def: Purulent inflammation of the cellular tissue of the orbit.**

**Cause:**

- Spread of inflammation from neighboring parts – nasal sinuses, Dacryocystitis, dental infection, deep injuries, retained foreign body,
- septic operations, DCR, RD, SQUINT
- posterior extension of suppurative infection of eye lid, panophthalmitis, facial erysipelas,
- Metastases in pyaemia

# Etiology

## **Modes of infection**

- Exogenous infection
  - Result from penetrating injury
- **Extension of infection from neighbouring structures**
  - Paranasal sinuses, teeth, face, lids, intracranial cavity, intraorbital structures
- Endogenous infection
  - Rarely develop as metastatic infection from breast abscess, etc.

## **Causative organisms**

- Streptococcus pneumoniae
- Staphylococcus aureus
- Streptococcus pyogenes
- Haemophilus influenzae

# Clinical features

1. Swelling, erythema, warmth, pain, tenderness of the lid
2. Orbital abscess pointing on the skin or conjunctiva



3. Proptosis – lateral and down
4. Restriction and pain of ocular movements
5. Diplopia
6. Afferent pupillary defect
7. Diminished vision due to compression of optic nerve, its blood supply, optic neuritis





**Fig. 17.30**  
Sinus-related orbital cellulitis



# COMPLICATIONS

## Complications

• Keratopathy  
• Optic neuritis  
• CRAO

## Orbital complications

- \* Subperiosteal abscess
- \* Orbital abscess

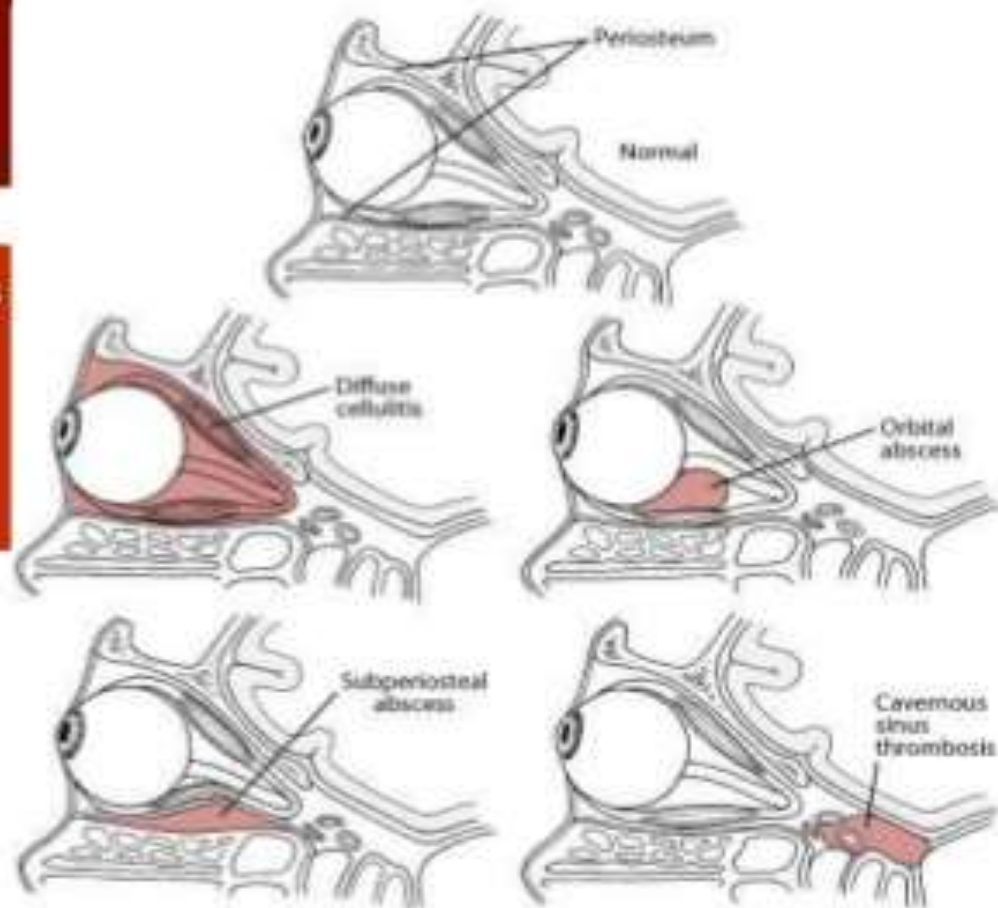
## Carotid abscess

• Spread of infection  
• Involvement of the orbit

## Intracranial complications

- \* Cavernous sinus thrombosis
- \* Meningitis
- \* Brain abscess

General  
septicemia/pyaemia



# INVESTIGATIONS

- **Bacterial cultures**
  - From nasal and conjunctival swabs and blood samples
- **Complete haemogram**
  - May reveal leukocytosis
- **X-ray PNS**
  - Identify associated sinusitis
- **Orbital ultrasonography**
  - Detect intraorbital abscess
- **CT scan & MRI**
  - Differentiating preseptal & postseptal cellulitis
  - Detect subperiosteal abscess
  - Orbital abscess
  - Intracranial extension
  - Deciding when & where to drain orbital abscess

# TREATMENT

- Orbital cellulitis is an emergency!
- Hospitalised the patient for aggressive management

## 1. Intensive antibiotic therapy

- Staph infections: high doses of penicillinase-resistant antibiotics+ampicillin
- Alternative: cefotaxime, ciprofloxacin, vancomycin
- *H. influenzae* : chloramphenicol / clavulanic acid
- Anaerobes : oral metronidazole 500mg every 8 hours

## 2. Analgesic & anti-inflammatory drugs

- control pain and fever

## 3. Topical antibiotic eye ointment

- QID, for corneal exposure and chemosis (severe proptosis)

## 4. Start nasal decongestant drops

## 5. Revaluation

- 2-3 times/day
- to monitor the response and modify the Rx accordingly



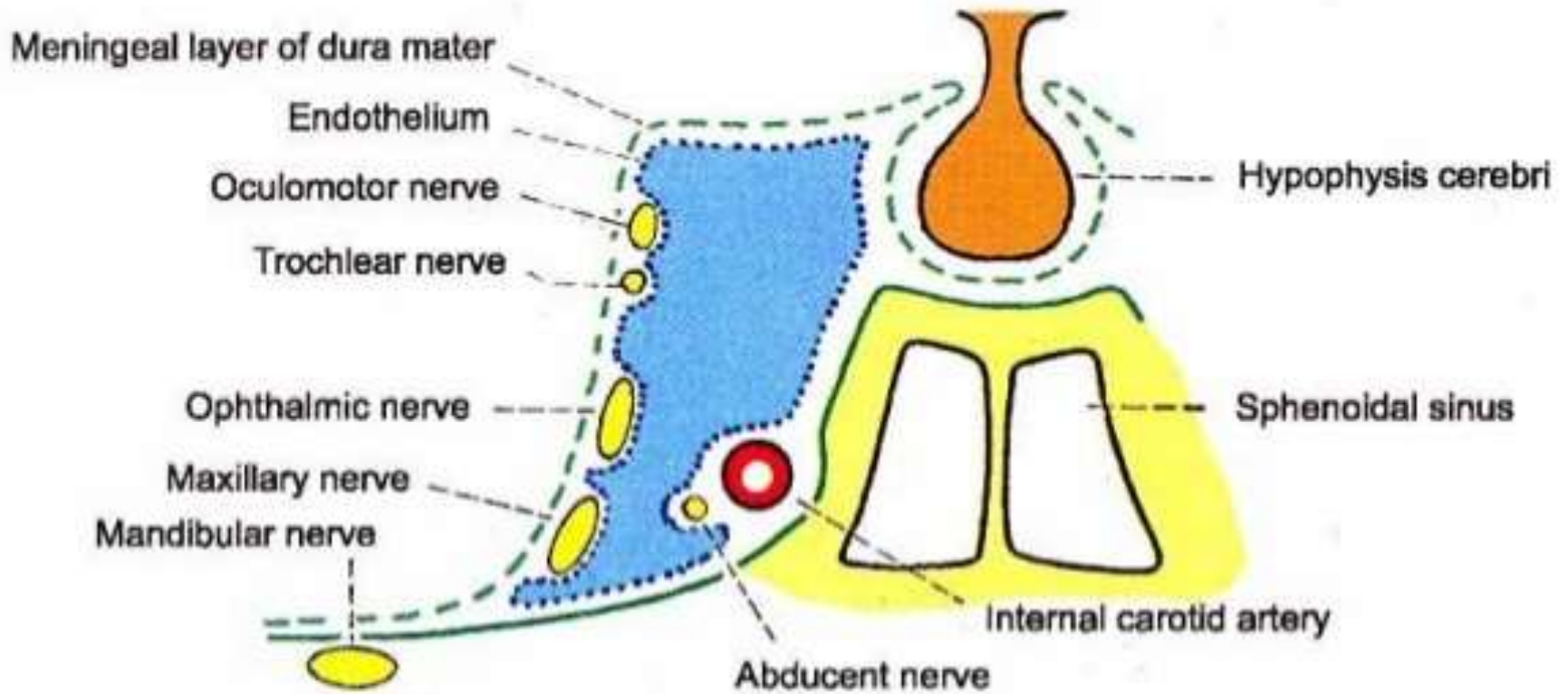
# Cavernous sinus thrombosis

# Cavernous sinus thrombosis

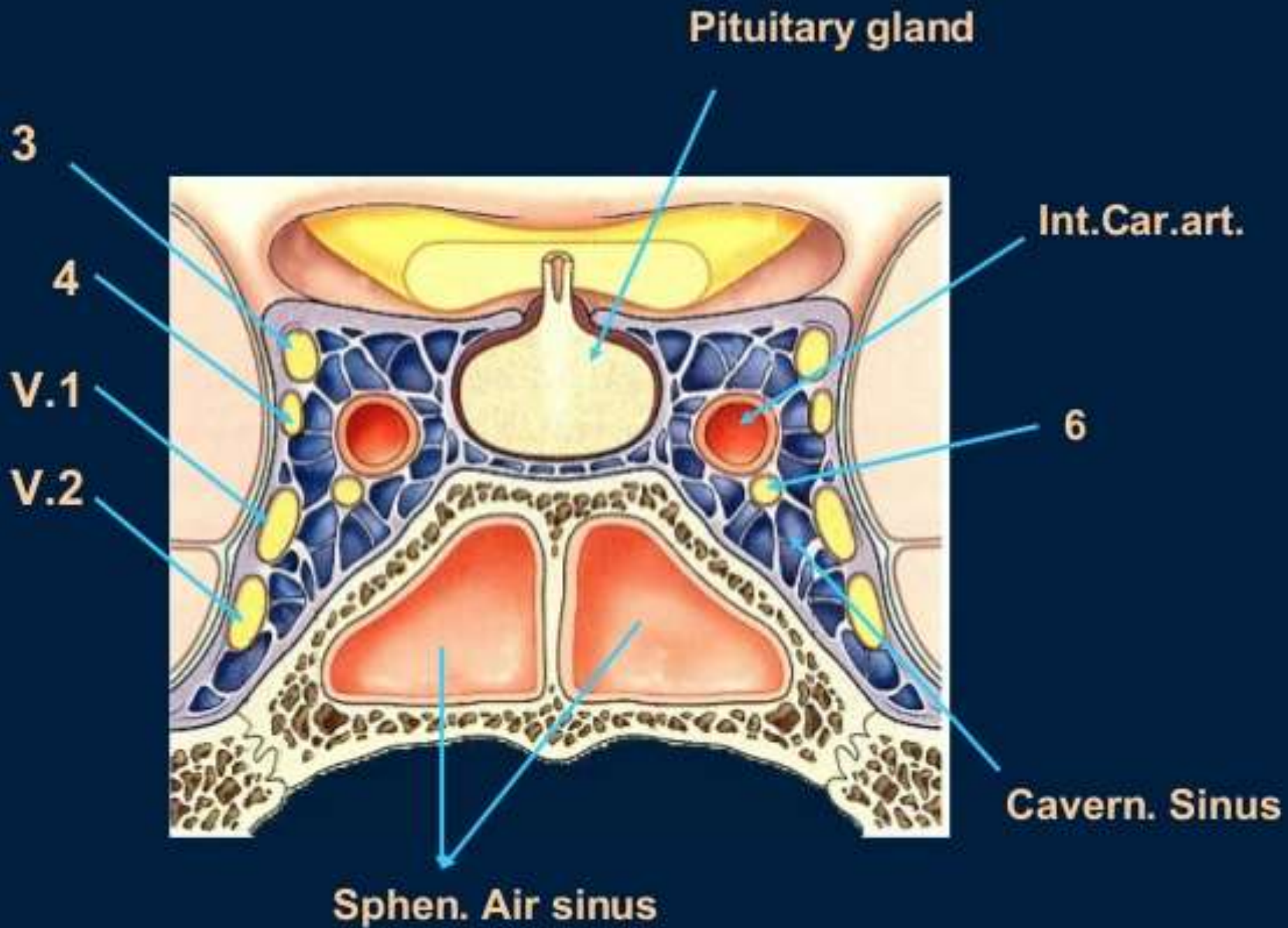
- Tributaries of cavernous sinus
- Sup and inf ophthalmic veins
- Labyrinthine vein from middle ear inf petrosal sinus
- Pterygoid plexuse through Middle meningeal veins

## Contents of cavernous sinus

- ▶ – Internal Carotid artery with sympathetic plexus
- ▶ – CN 3
- ▶ – CN 4
- ▶ – CN 5 (1<sup>st</sup> and 2<sup>nd</sup> divisions)
- ▶ – CN 6



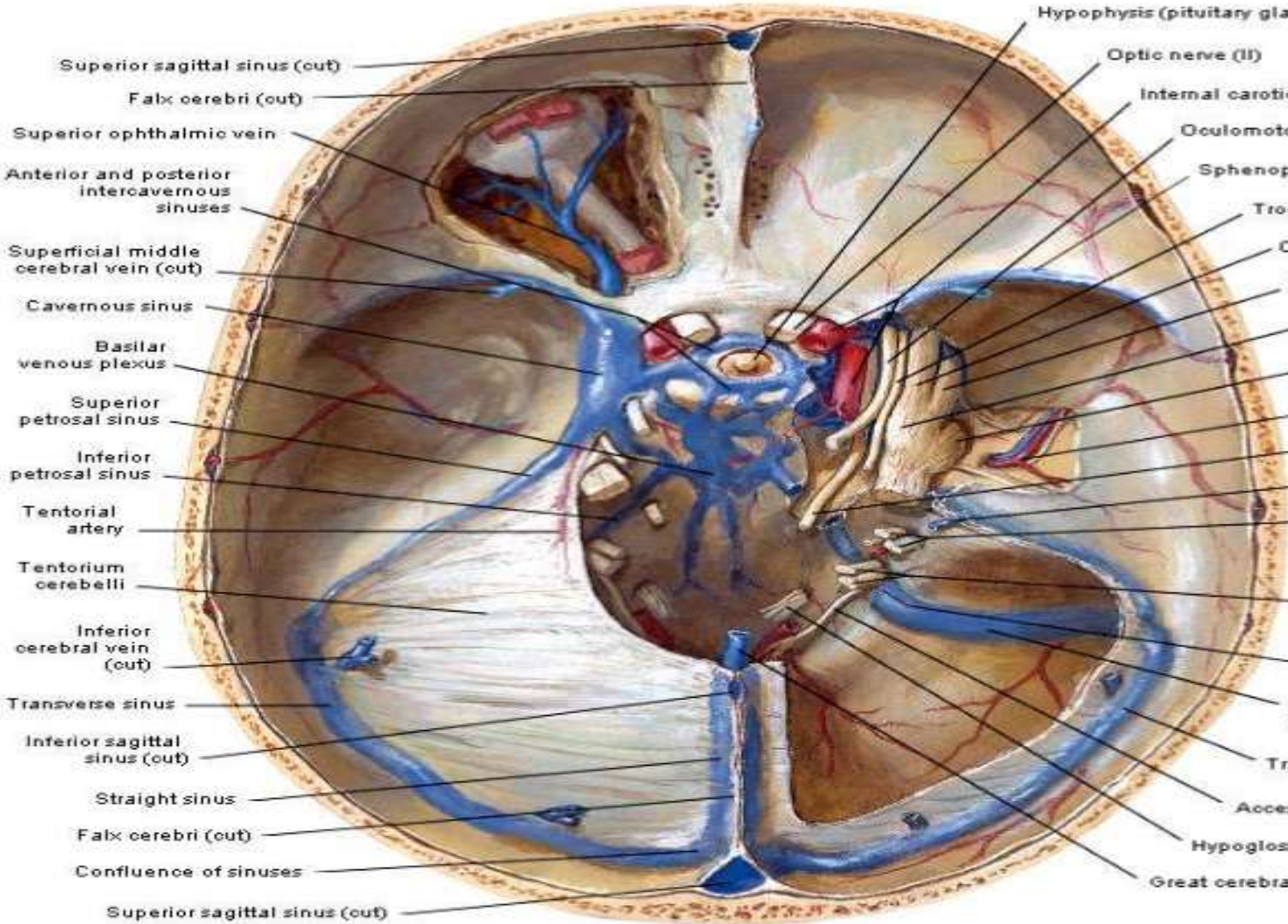
*Coronal section through the middle cranial fossa showing the relations of the cavernous sinus.*





# Dural Venous Sinuses

## Cranial Floor - Superior View



# Clinical features

- Unilateral initially becomes bilateral >50% cases
- Severe pain along ophthalmic nerve
- Lid oedema, chemosis, congestion,
- Proptosis
- 3<sup>rd</sup>, 4<sup>th</sup>, 6<sup>th</sup> nerve palsy
- L R palsy earliest sign
- Ophthalmoplegia

# contd

- Oedema of mastoid region
- Decreased vision-papilloedema
- other eye becomes infected
- Rigors, vomiting ,sever cerebral symptoms
- Death –meningitis,pulmonary infarction

# Investigations

1. T.C.D.C,ESR
2. CT orbit, sinus, brain
3. Blood, nasal, conjunctival and throat culture and sensitivity

# Treatment

- Intra venous broad spectrum antibiotics
- Anti coagulants
- Treatment of the cause if it is known
- Steroids if there is no contra indications
- A team effort of neurologists ,ENT specialists and ophthalmologists are needed

Thank You!



# Signs and symptoms

- Proptosis –abnormal protrusion of globe
- Enophthalmos –abnormal retraction of globe  
as in Micro-ophthalmos ,ptthisis bulbi,blow- out fracture,
- Exophthalmos –proptosis secondary to thyroid eye disease.  
(Measured by exophthalmometer)



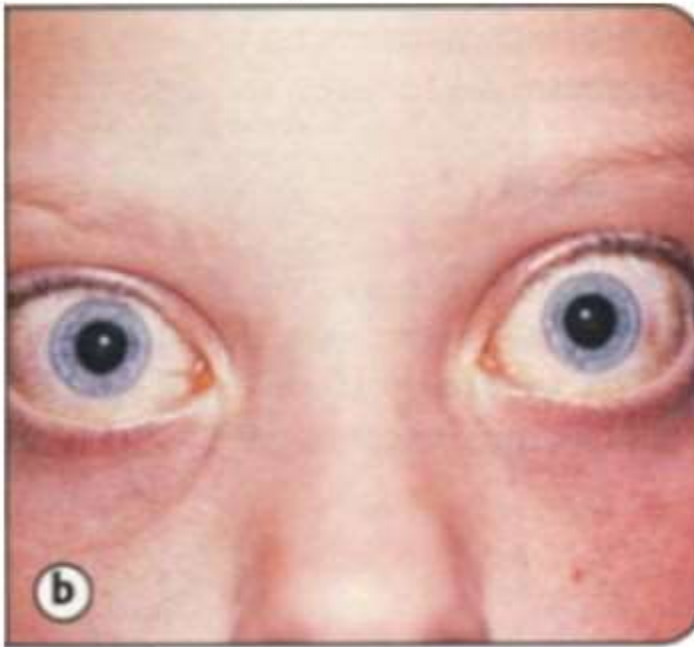




**FIGURE 8:** (Bullock) Patient M.M., with extruded implant. Prominent ptosis, enophthalmos, and deep superior sulcus are noted.



- Exophthalmos

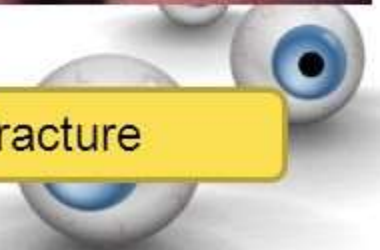


Graves'

- Enophthalmos



blow out fracture



# Pseudoproptosis



- Unilateral high myopia
- Unilateral buphthalmos
- Pseudocornea or ant staphyloma
- Retraction of mullers muscle by cocaine, enophthalmos in other eye
- Paralysis of extrinsic muscles

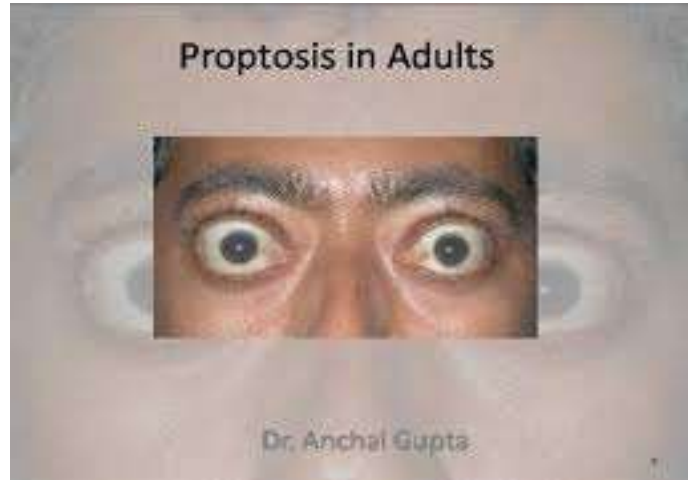
# Unilateral proptosis

- **Congenital** – dermoid , teratoma
- **Inflammatory**-Orbital cellulitis, Idiopathic orbital inflammatory disease , gumma, sarcoidosis,TB  
Thrombosis of orbital vein with or without cavernous sinus thrombosis
- **Traumatic**-Orbital haemorrhage or emphysema,IO
- **Tumours** of orbit or its content
- **Cystic**-parasitic cyst  
Arteriovenous aneurysm

# Bilateral proptosis

- Endocrine exophthalmos –thyroid eye diseases
- Cavernous sinus thrombosis
- Symmetrical orbital tumours (lymphoma ,pseudoleukaemia)
- **Developmental** -Diminished orbital volume – oxycephaly or tower skull

# Axial vs eccentric proptosis



- Axial-eye is pushed centrally forwards, lesion is situated in central space.
- Eccentric-situated elsewhere in orbit, pushes eye in opposite direction.

# Pulsatile proptosis

- **Transmitted vascular pulsation-**
  - Aneurysm of ophthalmic art
  - Carotid -cavernous fistula
- **Transmitted CSF PULSATION-**
  - Absence of greater wing of sphenoid
  - neurofibromatosis
  - Erosion of orbital roof
  - Meningocele, meningoencephalocele

# Intermittent proptosis –

orbital varices,  
lymphangioma  
recurrent orbital haemorrhage ,  
recurrent orbital emphysema





# APPROACH

HISTORY

LOCAL  
EXAMN

SYSTEM  
EXAMN

INVESTIG  
ATIONS

IMAGING

# HISTORY TAKING

- **Protrusion of eyeball** - Age of Onset , duration , progression
- Constant or intermittent
- Variation with posture / strain
- **Decreased vision** – preceded/followed
- Stationary/progressive
- Associated field defects

- **h/o Pain**
- **h/o Double vision**
- **h/o Trauma**
- **h/o fever , chills ,systemic symptoms**
- **h/o cancer**
- **h/s/o thyroid disease ,TB , DM ,HTN ,HIV , Syphilis**

# LOCAL EXAMINATION

- **1) INSPECTION –**

- ★ Proptosis or pseudoproptosis

- ★ Unilateral or bilateral

- ★ Axial or eccentric

- **2) PALPATION – size ,shape,surface,margins consistency , tenderness , compressibility**

Thrill /increase with valsalva/ orbital rims / regional lymph nodes

- **3)AUSCULTATION - bruit**

**4) EOM MOTILITY** – decreased in thyroid orbitopathy, extensive tumor growths and neurological deficit

**5) VISUAL ACUITY** – maybe decreased due to

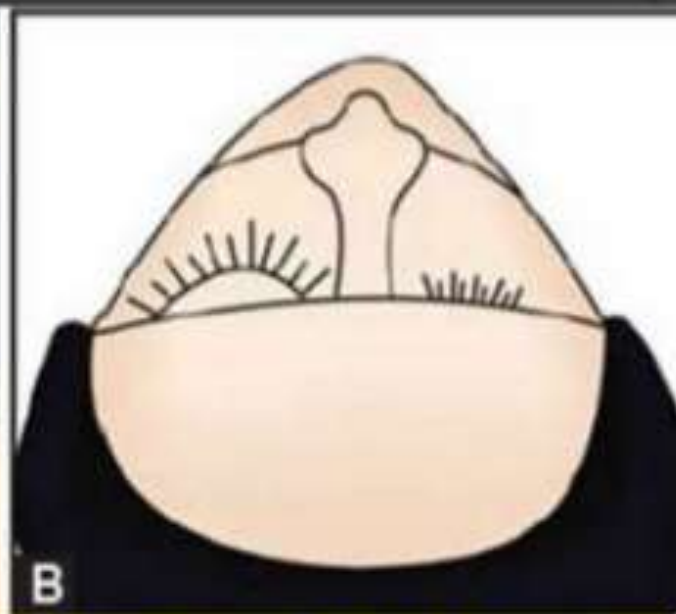
➔ Refractive changes due to pressure on eyeball

➔ Optic nerve compression

➔ Exposure keratopathy

**6) PUPIL REACTION** – RAPD suggests optic nerve compression

## ASSESSMENT & MEASUREMENT OF PROPTOSIS



**NAPHZEIGER'S TEST:**

**NOTE THE PROMINENCE OF LEFT EYE.  
THE RIGHT IS NOT VISIBLE**



## Clinical methods for measurement of proptosis:

- × A) **PLASTIC RULER:** can measure proptosis from the lateral orbital rim to the corneal apex, holding the ruler parallel to ground.
- × B) **LUEDDE'S EXOPHTHALMOMETER:** has several advantages
  - notch confirms to lateral orbital rim.
  - the scale starts from tip of instrument, where the notch meets the lateral orbital rim.





- markings on both sides help to avoid parallax error.
- luedde's exophthalmometer is better than hertel's if there is facial asymmetry.

C) **HERTEL'S EXOPHTHALMOMETER:** m/c used.

- it may use prisms or mirrors set at 45 degree angles.
- it is best for serial follow up of patients.





**NOTE THE SPACE BETWEEN THE CLOSED RIGHT EYE & THE SCALE IN NORMAL EYE**



**NOTE THE OBLITERATION OF SPACE. THE SCALE IS IN CONTACT WITH THE EYELID OF PROPTOSSED EYE.**

# contd

- EXOPHTHALMOMETER –Lueddes ,Hertels  
( $>21\text{mm}$  or diff of  $2\text{mm}$  between two eyes)
- inspection of PNS , cranial nerves and systemic examination

# INVESTIGATIONS

- Lab-T3,T4,TSH level, serum ACE level for sarcoidosis
- x ray –P A view for calcification ,F B ,hyperostosis in meningioma
- Caldwell view –angled PA view for frontal sinus
- Lat view for intracranial lesions
- Waters view for orbital floor fracture

# Investigations Contd

- Soft tissue –USG, C T SCAN, MRI
- Orbital vasculature-carotid angiography, digital subtraction angiography and orbital venography
- FNAC,Incisional biopsy ,Excisional biopsy

# Thyroid ophthalmopathy or dysthyroid eye disease

## Pathogenesis

- Autoimmune reaction directed against orbital fibroblast and extraocular muscles.
- Anti-TSH receptor antibodies (**thyroid stimulating immunoglobulin which mimic TSH**) level decides severity of ophthalmopathy, not the level of T3 or T4
- Ophthalmic Graves disease-ophthalmopathy asso with thyrotoxicosis .

## *PATHOGENESIS*

- This involves an organ specific autoimmune reaction in which a humoral agent (IgG antibody) produces the following changes:
- **INFLAMMATION OF EXTRAOCULAR MUSCLES**
- **INFLAMMATORY CELLULAR INFILTRATION**

## PATHOGENESIS:

### INFLAMMATION OF EXTRAOCULAR MUSCLES

- Pleomorphic cellular infiltration, increased secretion of glycosaminoglycans, osmotic retention of water.
- ↓
- Muscles become enlarge ( 8 times their normal size, may compress optic nerve).
- ↓
- Subsequent degeneration of muscle fibers eventually leads to fibrosis
- ↓
- Restrictive myopathy and diplopia.



## PATHOGENESIS:

### INFLAMMATORY CELLULAR INFILTRATION

Infiltration with lymphocytes, plasma cells, macrophages & mast cells of interstitial fluid, orbital fat & lacrimal glands



Accumulation of glycosaminoglycans & retention of fluid.



Increase in volume of orbital contents & secondary elevation of intraorbital pressure.



Secondary elevation of intraorbital pressure.

# Symptoms

- Dry Puffy eyes, staring look, Bulging eyes, Diplopia, Visual loss, Field loss, pain
- **Hyperthyroidism symptoms-**  
palpitations, Nervousness, sweating, Heat intolerance, Tremor, Weight loss etc

# CLINICAL MANIFESTATION

5 main clinical manifestations of TED are:

## 1... SOFT TISSUE INVOLVEMENT

(PERIORBITAL & LID SWELLING, CONJUCTIVAL HYPEREMIA.)

## 2... LID RETRACTION

## 3... PROPTOSIS

(PASSIVE OR MECHANICAL PROTRUSION OF EYE BALL)

## 4... OPTIC NEUROPATHY

(SERIOUS COMPLICATION – COMPRESSION OF OPTIC NERVE MAY LEAD TO VISUAL IMPAIRMENT)

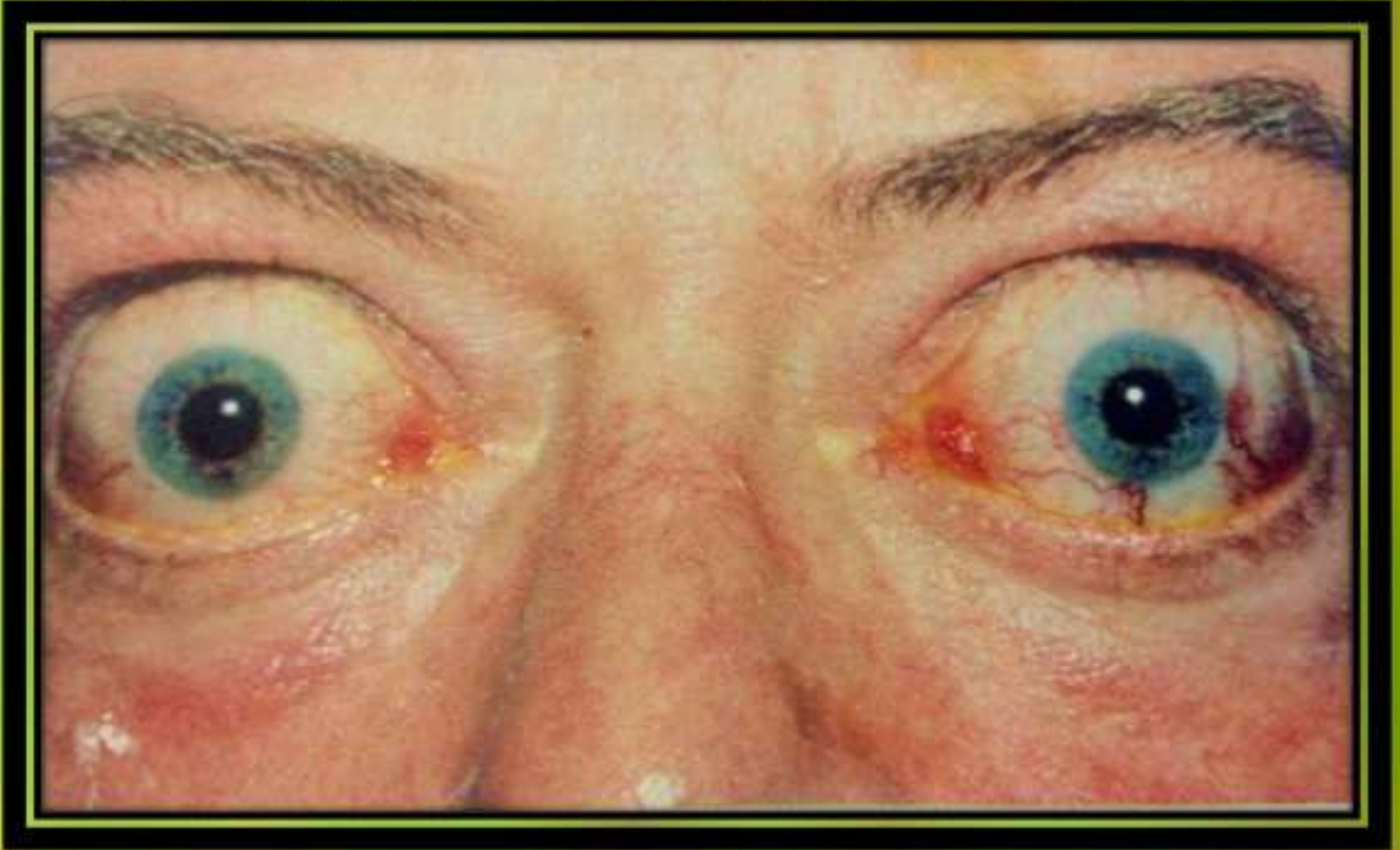
## 5... RESTRICTIVE MYOPATHY

(OCULAR MOTILITY IS REDUCED INITIALLY BY INFLAMMATORY EDEMA & LATER BY FIBROSIS)

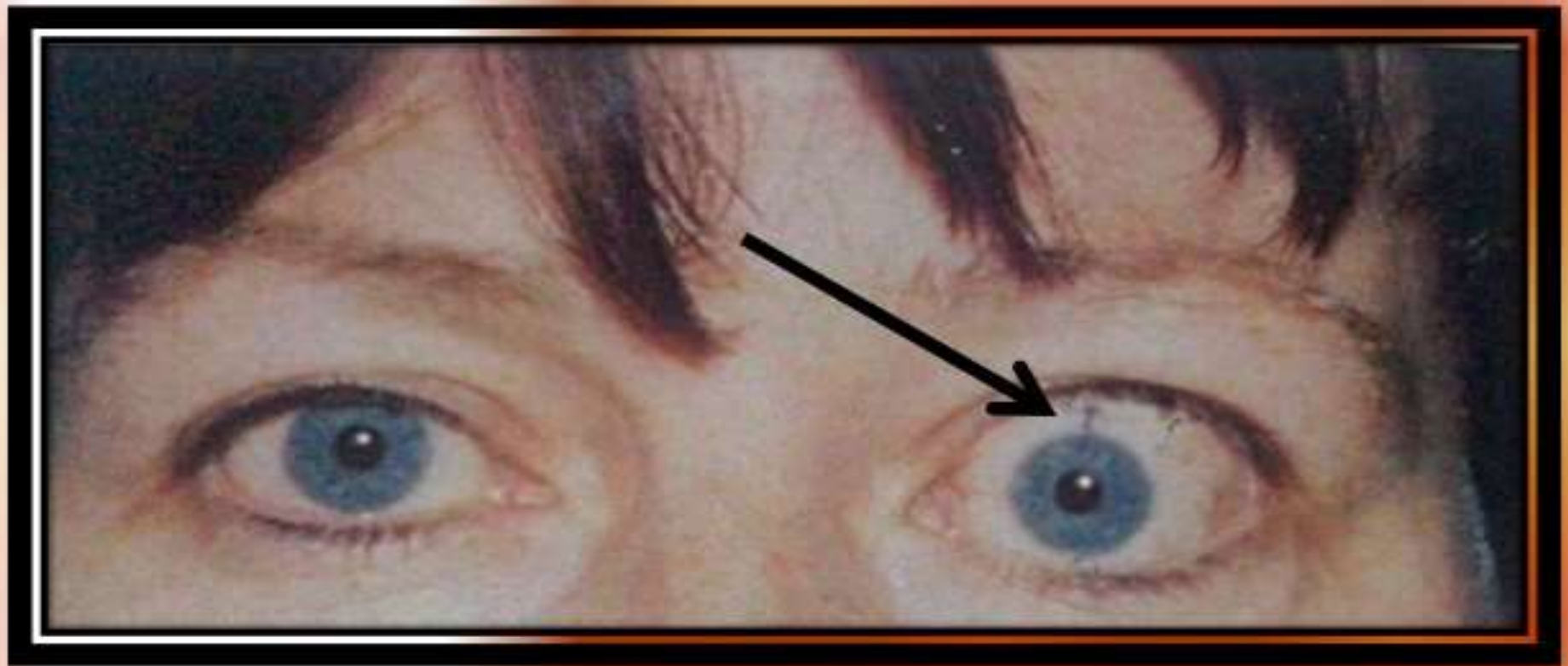
# Warners classification (NO SPECS)

- Grade 0- **No symptoms and signs**
- Grade 1- **Only signs (lid retraction)**
- Grade 2- **Soft Tissue Changes(chemosis,grit)**
- Grade 3- **Proptosis**  
minimum<23, moderate, >28marked
- Grade 4- **EOM Involvement**
- Grade 5- **Corneal Involvement**
- Grade 6- **Sight Loss**

***SEVERE BILATERAL PROPTOSIS & LID RETRACTION IN THYROID EYE DISEASE***



**LEFT EYE SHOW LID RETRACTION**  
**& MILD PROPTOSIS**



**von GRAEFE SIGN( RIGHT EYE)**



# KOCHER SIGN





# RESTRICTED LEFT EYE ABDUCTION



# CLINICAL MANIFESTATIONS

THYROID EYE DISEASE

## SIGNS: B-LOCAL

4 Eyelids signs:  
(Lid retraction  
Dalrymple's sign)



# CLINICAL MANIFESTATIONS

## THYROID EYE DISEASE

### SIGNS: B-LOCAL

- 4 Eyelids signs:
  - Staring and frightened appearance of the eyes on fixation (Kocher's sign).



# CLINICAL MANIFESTATIONS

THYROID EYE DISEASE

**SIGNS: B-LOCAL**

- 4 Eyelids signs:
  - Lack of convergence (Möbius's sign)



# CLINICAL MANIFESTATIONS

## THYROID EYE DISEASE

### SIGNS: B-LOCAL

- 4 Eyelids signs:
  - Lack of forehead wrinkling on upward gaze (Joffroy's sign)



# CLINICAL MANIFESTATIONS

## THYROID EYE DISEASE

### SIGNS: B-LOCAL

- 4 Eyelids signs:
  - Incomplete and infrequent blinking (Stellwag's sign)
  - Upper lid twitches , fine tremors on slight closure (Rosenbach's sign)
  - Defective eye movement (Ballett's sign)

# Investigations

- Thyroid function test - (pt euthyroid ,hyperthyroid or hypothyroid state )
- B scan
- CT scan
- Forced duction test

# treatment

- Topical decongestants, lubricants
- Medical –thyroxine and oral radioactive iodine therapy
- 
- Steroids – 40 -60 mg prednisolone orally
- Radiotherapy-1000rads from each lateral port
- Surgical-tarsorrhaphy ,Orbital Decompression –through floor by caldwell- Luc approach
- Two wall or three wall decompression

Muscle surgery , Canthoplasty, correction of lid retraction etc.



Thank You!

