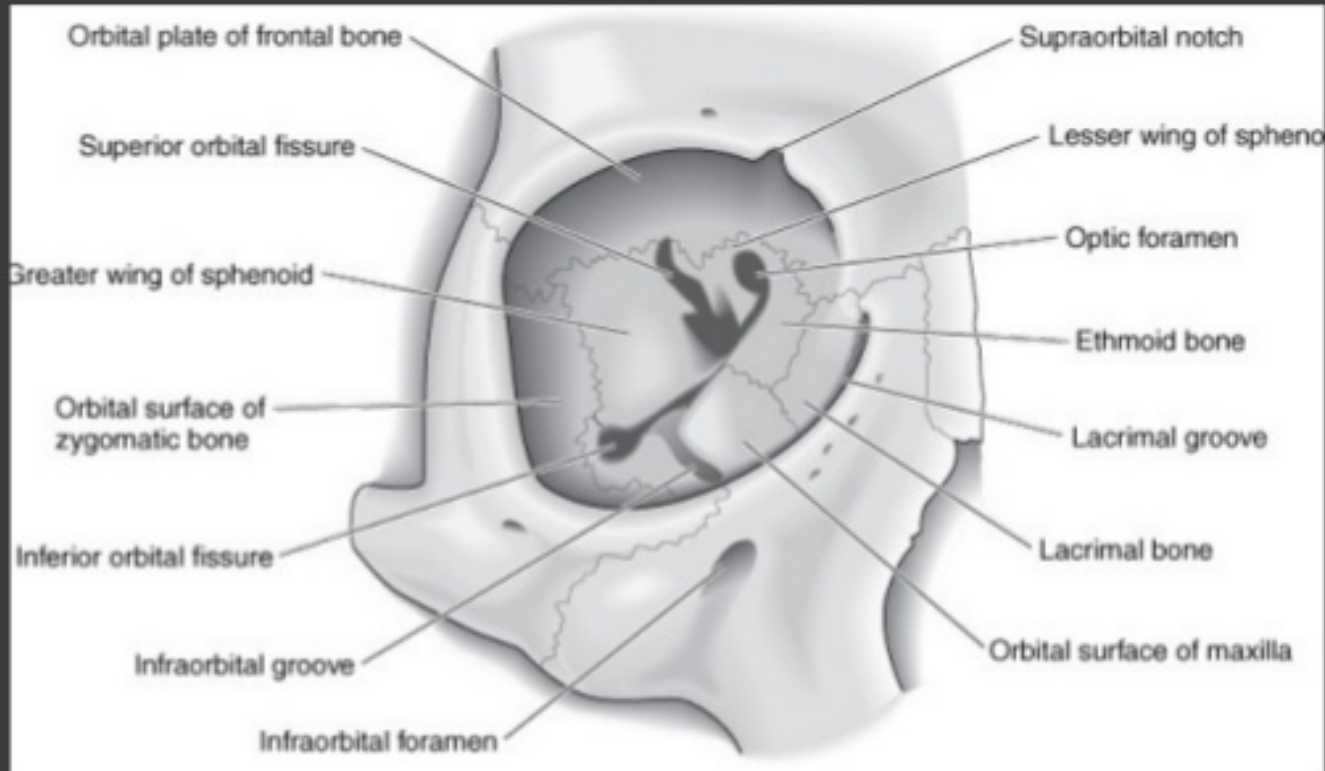


Orbit

Dr Vibhavari Barhate

Dept Of Ophthalmology

Bones of Orbit



Frontal
Lacrimal
Maxillary

Ethmoid
Palatine
Zygomatic

Sphenoid

● Lateral wall

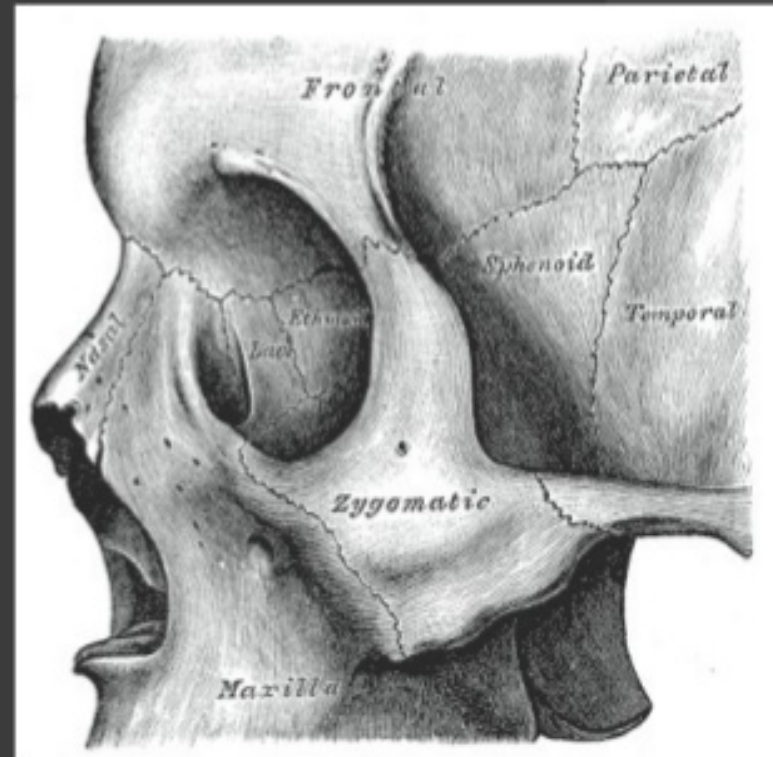
Greater wing –sphenoid

Orbital surface –

Frontal process of zygomatic

Inferiorly – inf orbital fissure

Medially – sup orbital fissure



● Floor of orbit

Maxilla

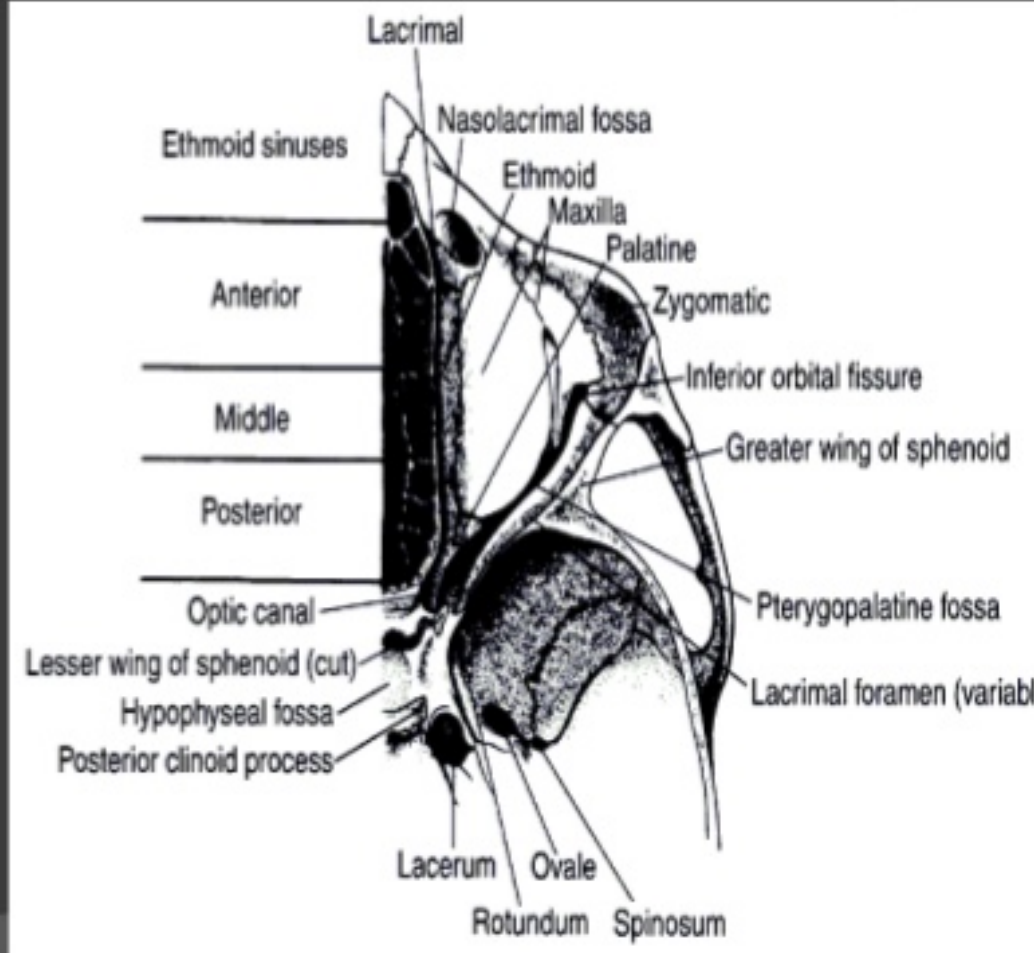
Zygomatic

Palatine

Triangular segment

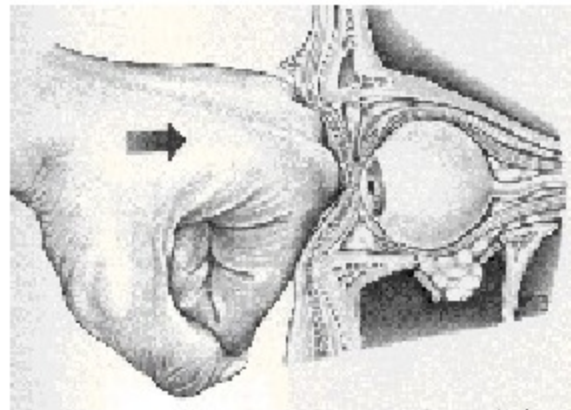
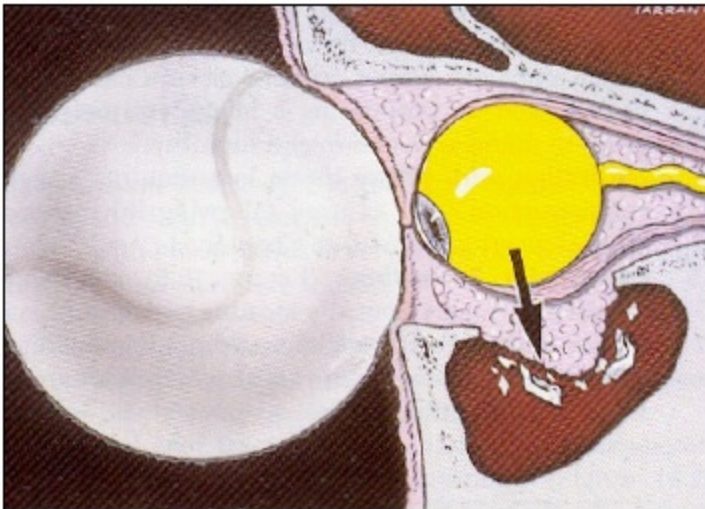
-- thinnest

Inferior orbital groove



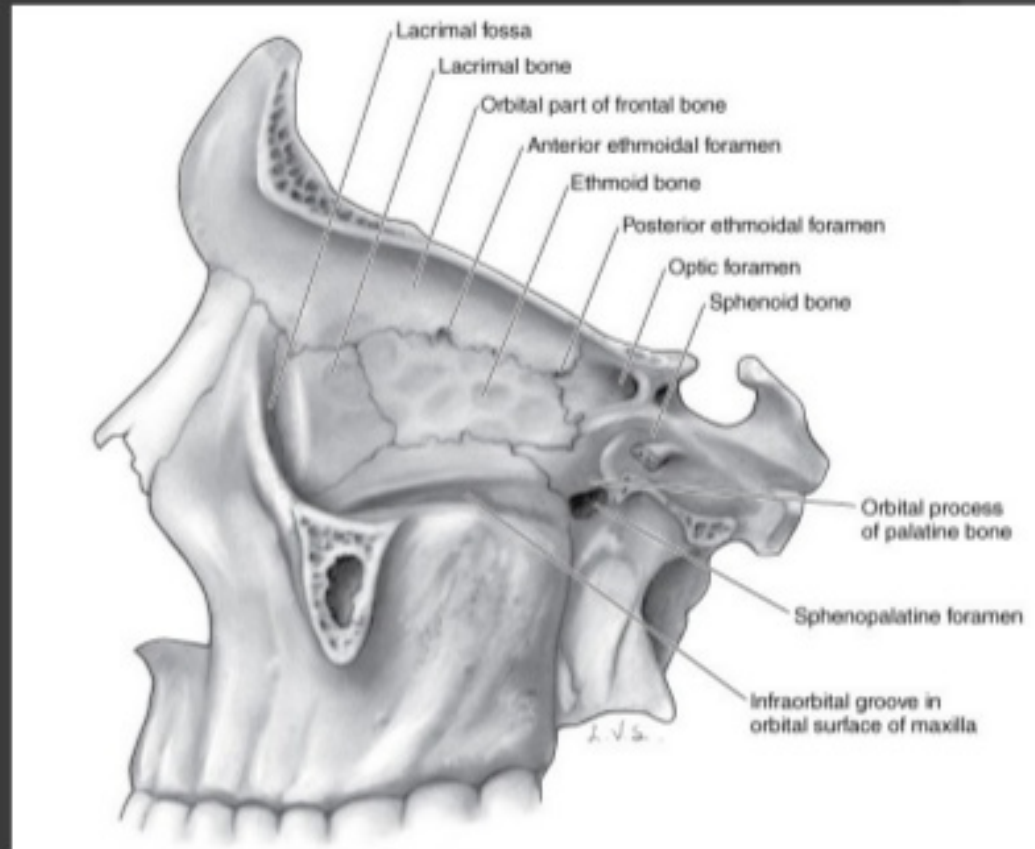
Theories of Blow-Out Fracture

- **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



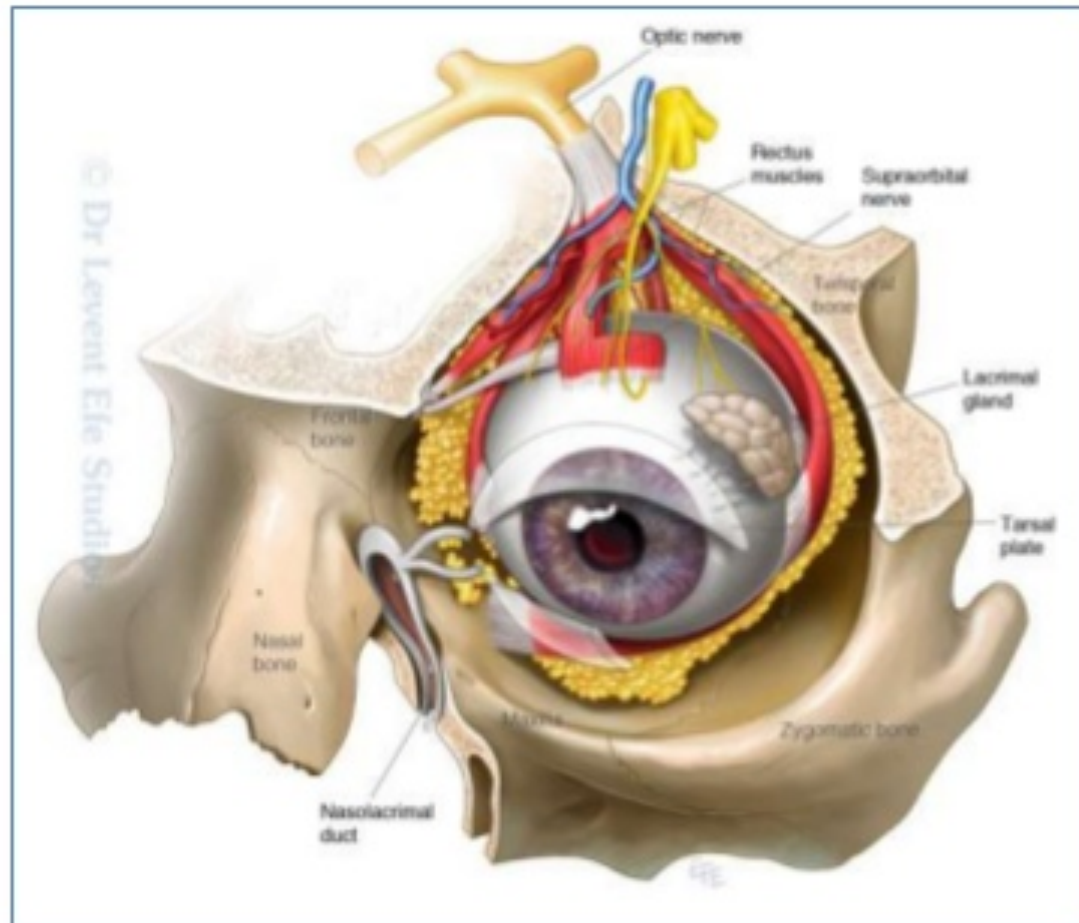
● Medial wall

Body of sphenoid
Ethmoid
Lacrimal
Maxilla[frontal
process]

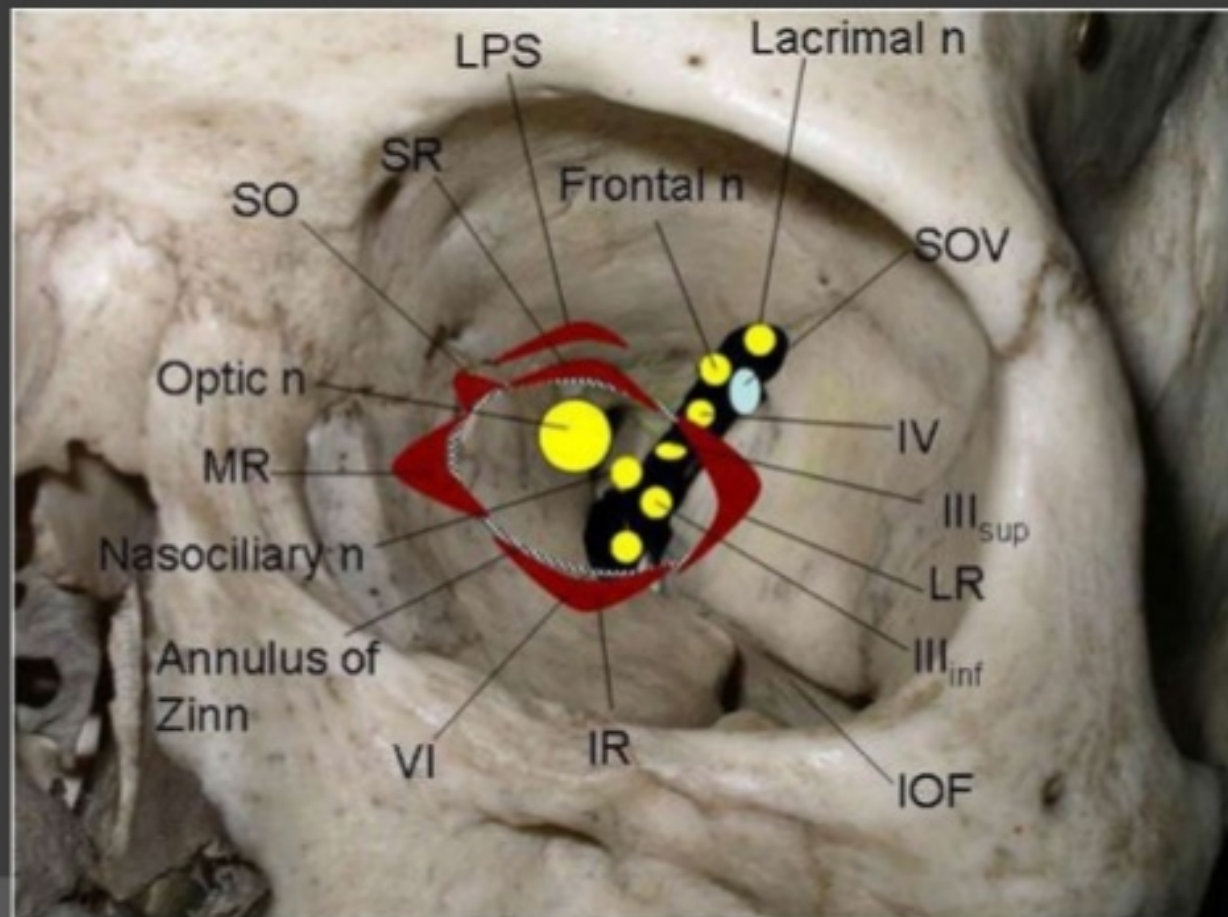


Orbital contents

- 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

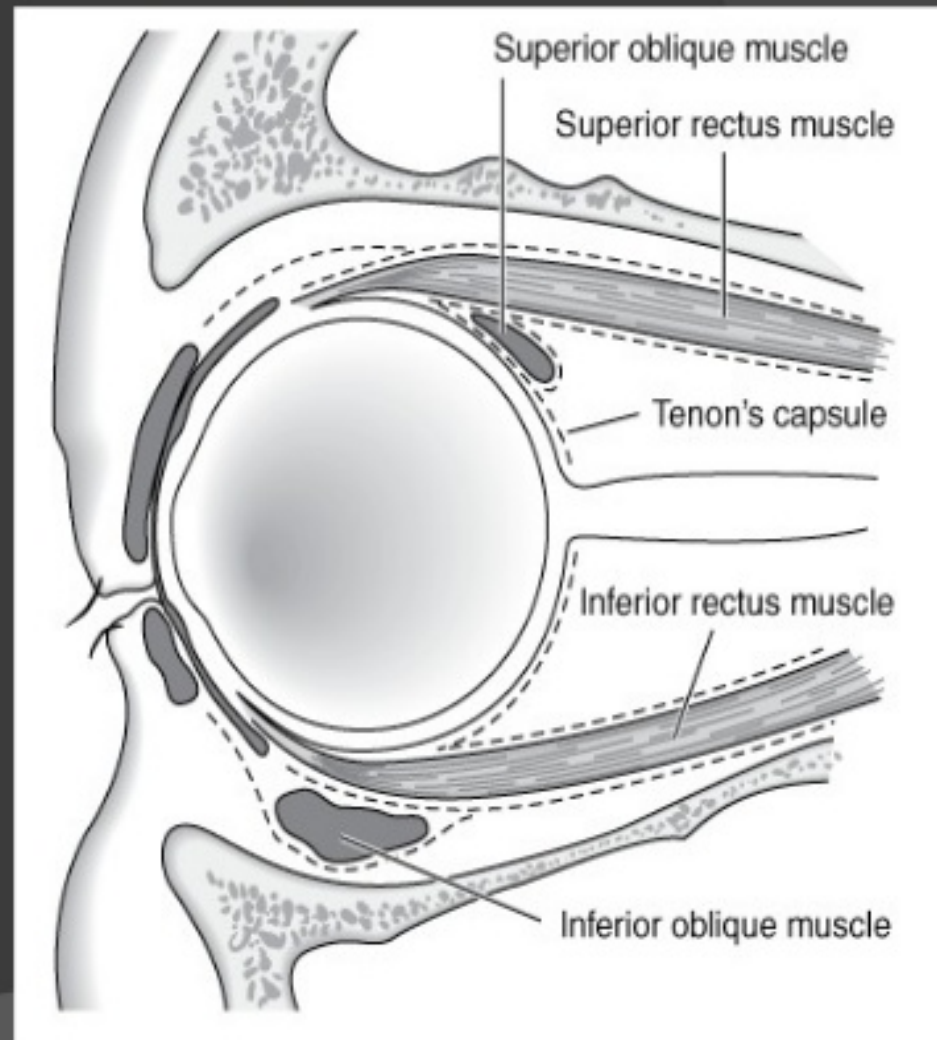


● Orbital apex



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: Knoop 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

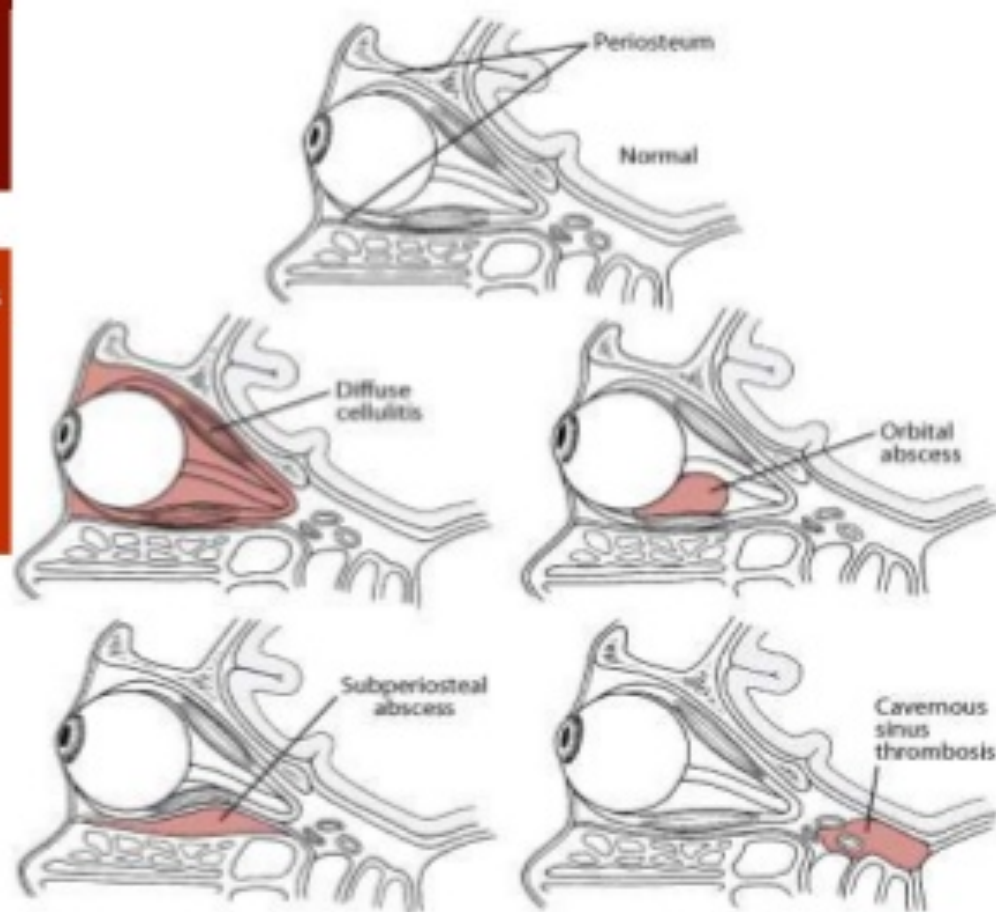
Carotid abscess

• 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



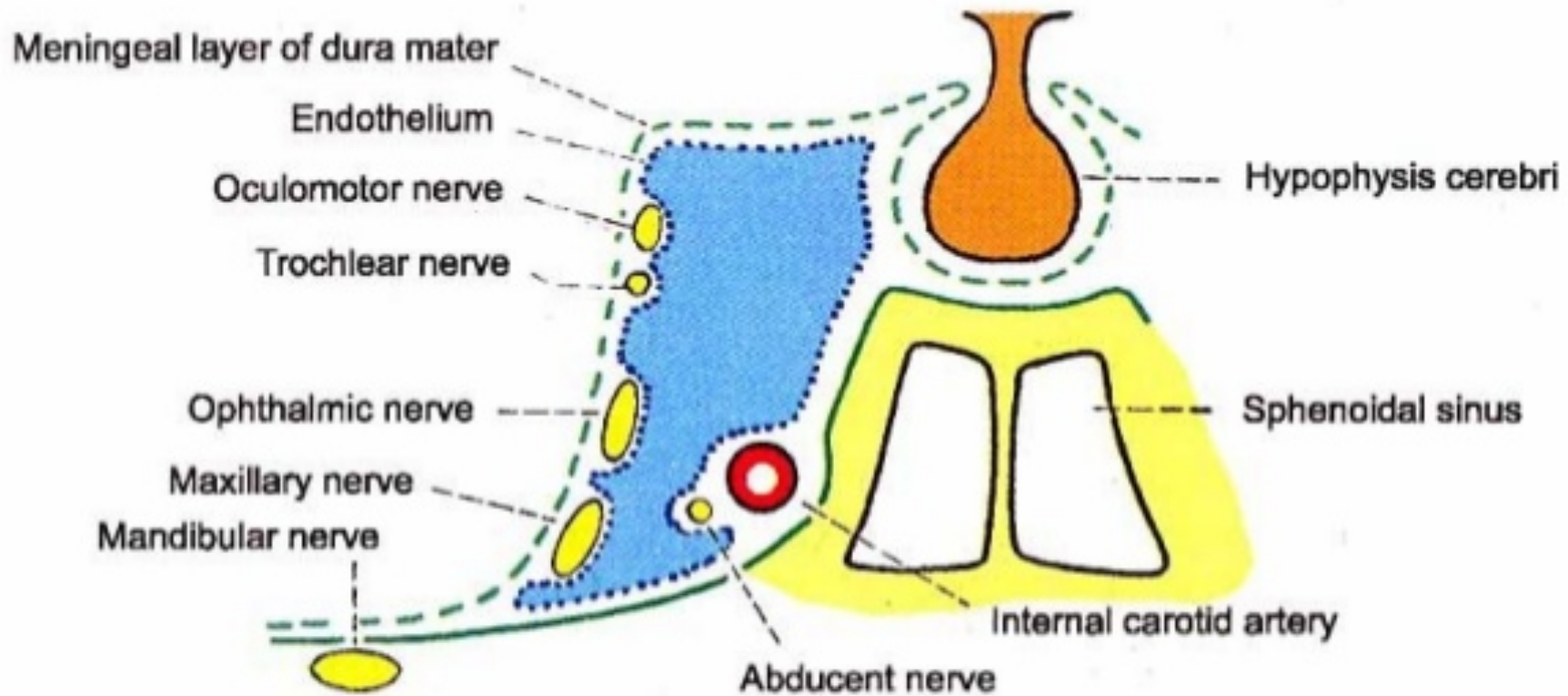
Cavernous sinus thrombosis

Cavernous sinus thrombosis

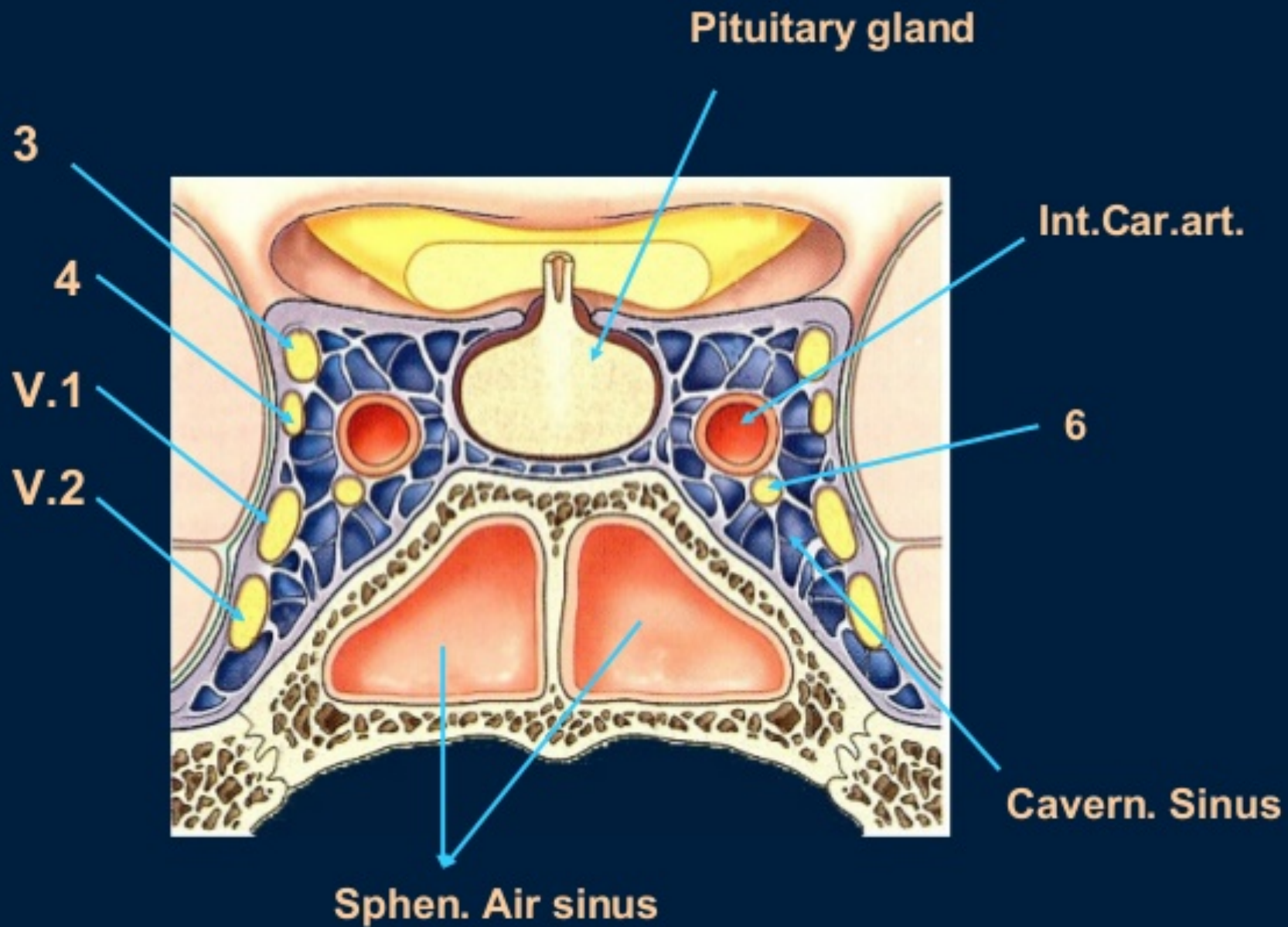
- Tributaries of cavernous sinus
- Sup and inf ophthalmic veins
- Labyrinthine vein from middle ear inf petrosal sinus
- Pterygoid plexuse through Middle meningeal veins

Contents of cavernous sinus

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

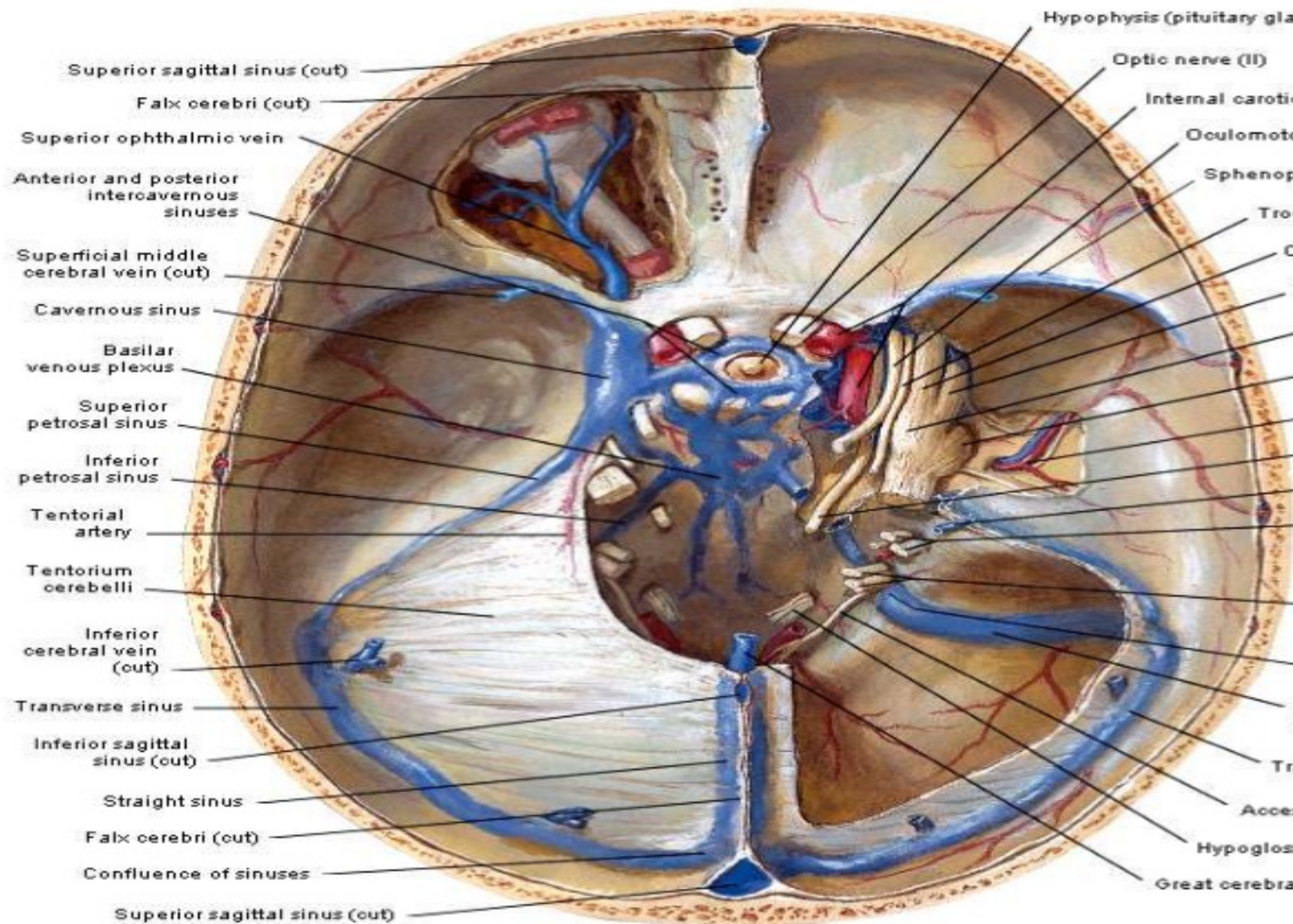


Coronal section through the middle cranial fossa showing the relations of the cavernous sinus.



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
- 3rd, 4th, 6th 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 ,pthisis bulbi,blow- out fracture,
- Exophthalmos –proptosis secondary to thyroid eye disease.
(Measured by exophthalmometer)

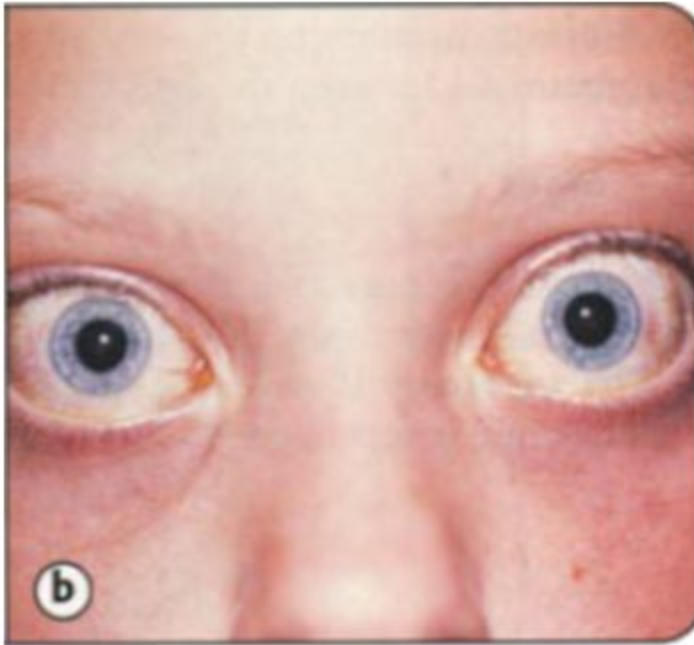




FIGURE 8: (Bullock). Patient M.M., with extruded implant. Prominent ptosis, enophthalmos, and deep superior sulcus are noted.

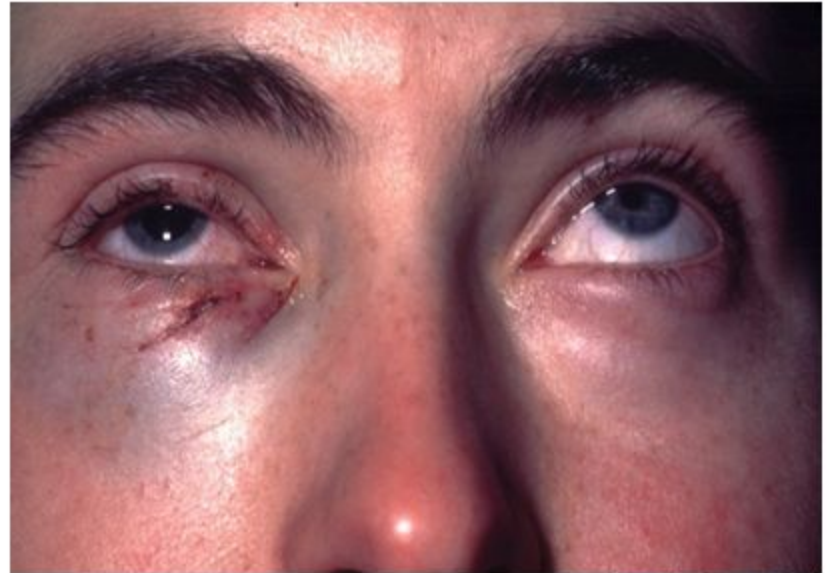


- Exophthalmos

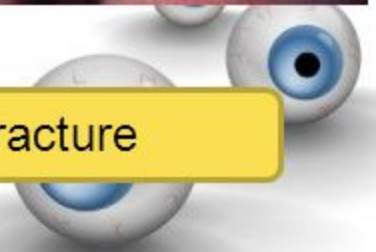


Graves'

- 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



Pseudocornea RE



Myopia RE



Buphthalmos LE

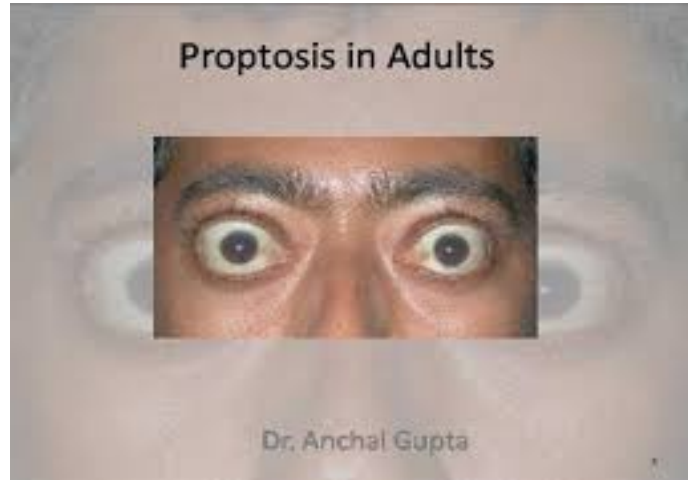
Unilateral proptosis

- **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 grater 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

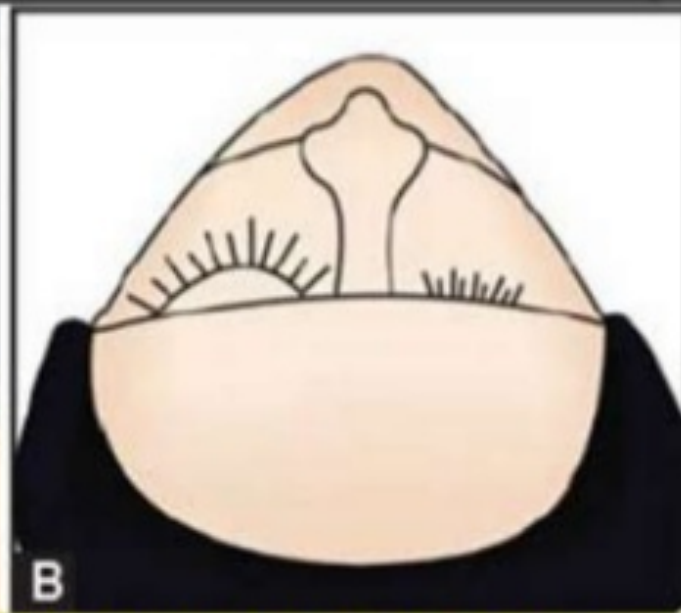
➔ Refractive changes due to pressure on eyeball

➔ 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 2mm 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 IMPAIREMENT)

5...RESTRICTIVE MYOPATHY

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

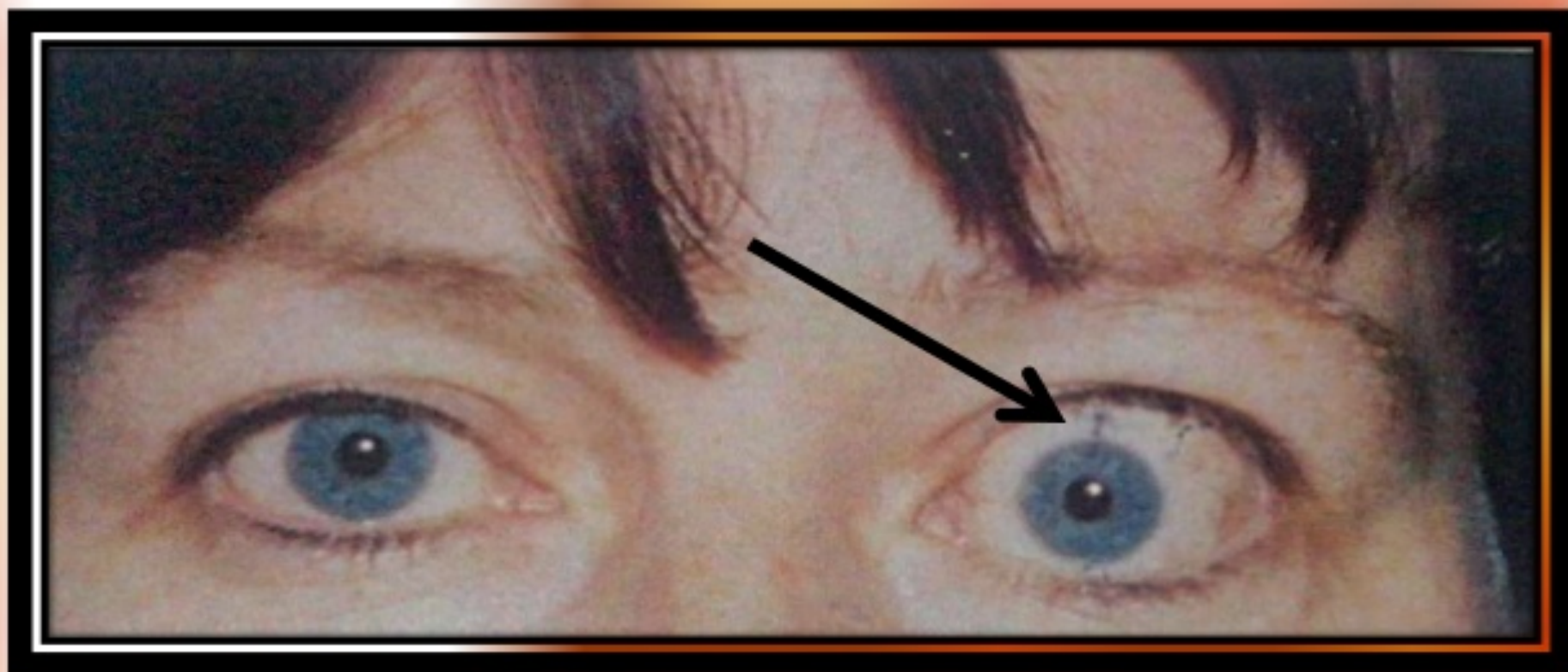
Warners classification (NO SPECS)

- 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 (Mobius'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!

