ORBITAL CELLULITIS AND CAVERNOUS SINOUS THROMBOSIS

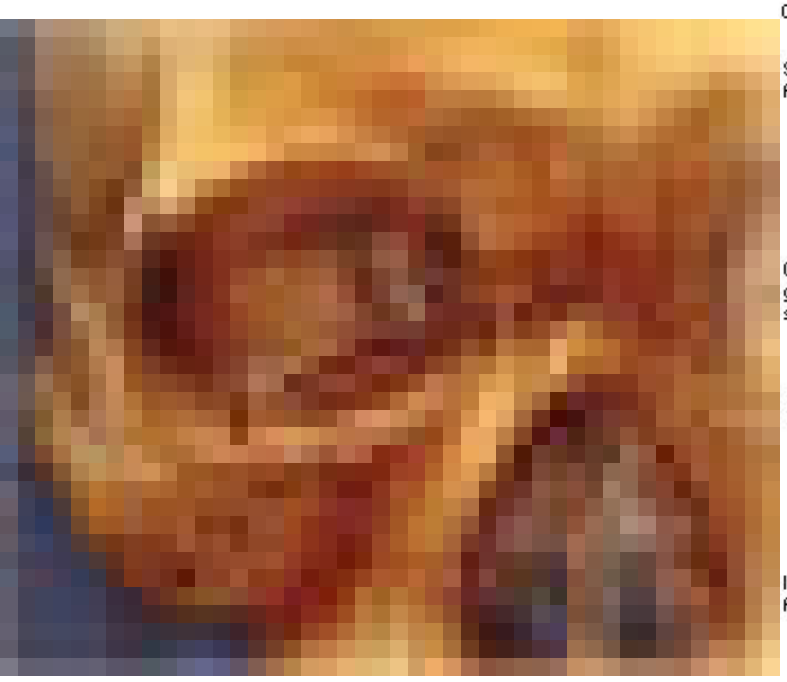
ORBIT

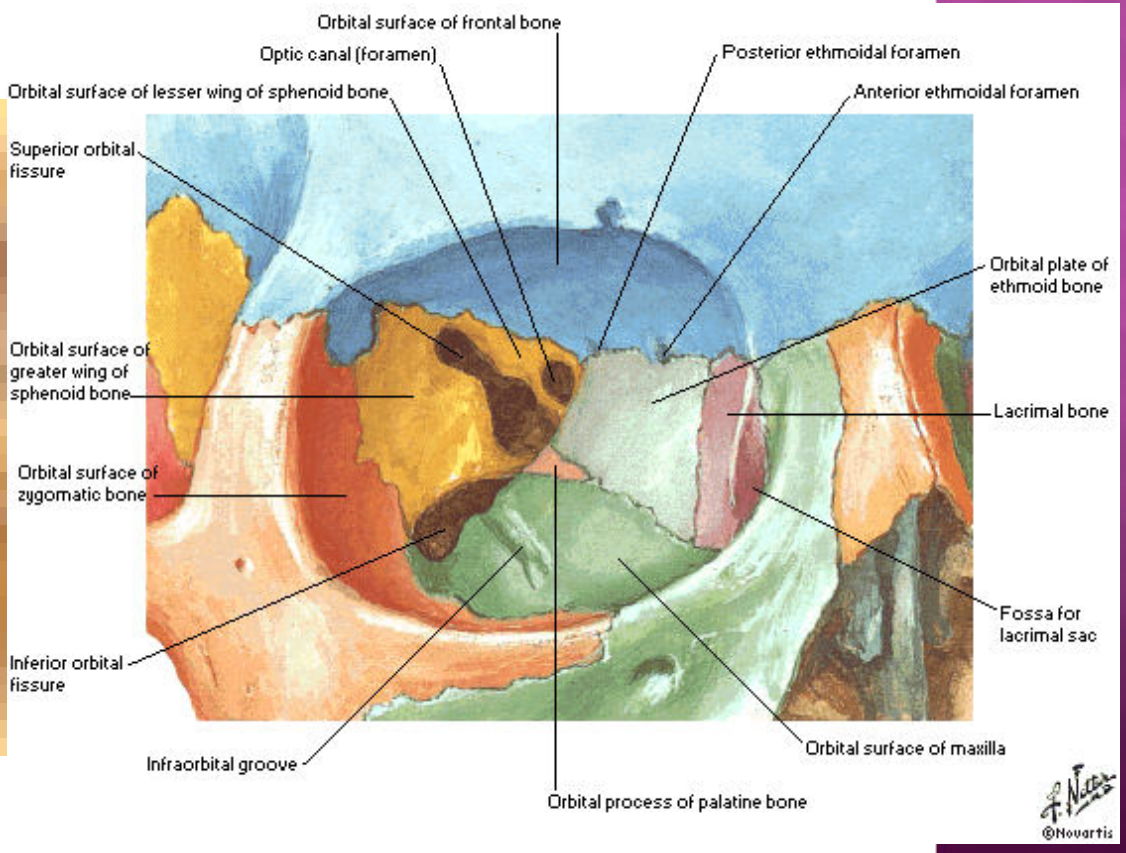
- Bony house of eyeball
- Protects the eye
- Facilitates motility

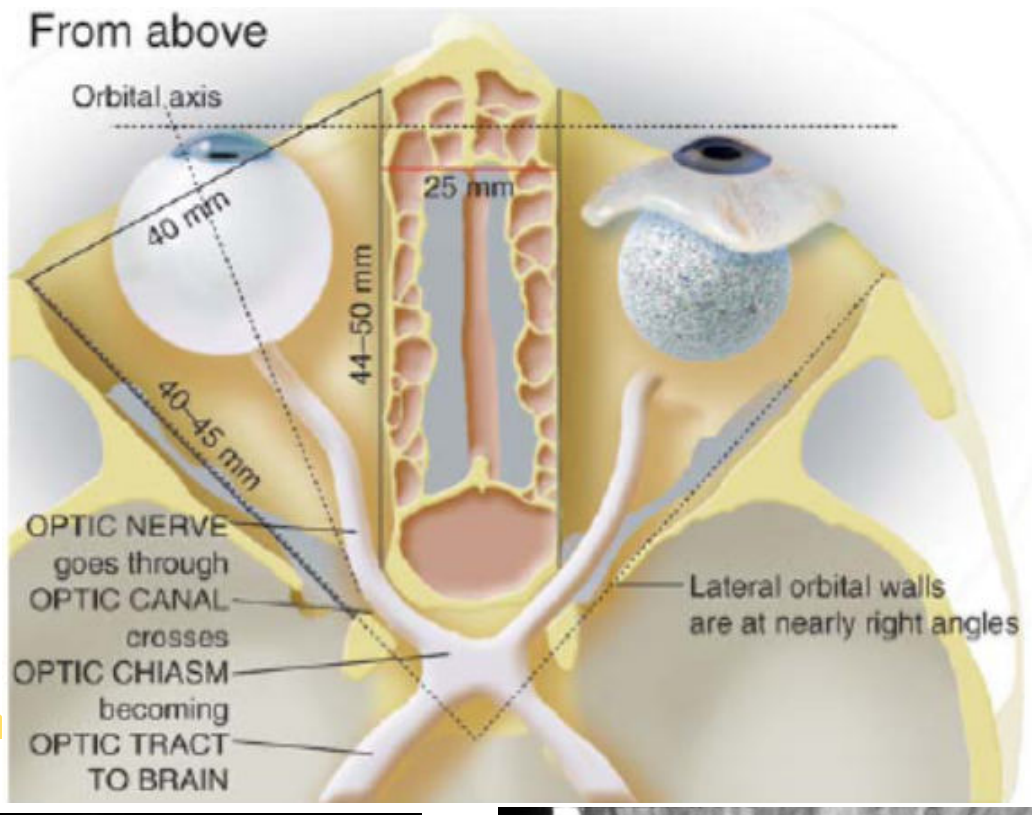
Contents:

- Eyeball
- Nerves – II,III,IV,VI and part of V nerve
- Blood vessels
- Lacrimal gland

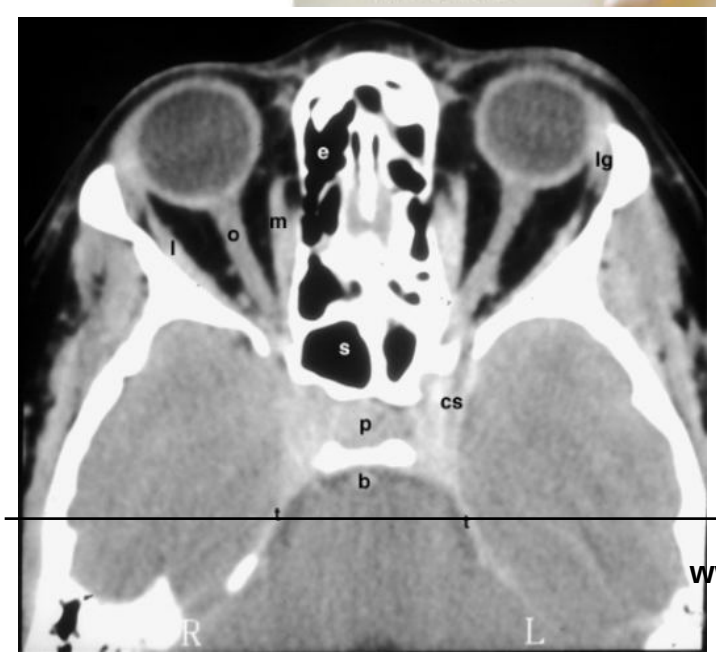
- Pear shaped cavity
- Four walls tapering posteriorly
- Formed by Seven bones
- Volume – 30 ml
- Three walls are related to paranasal sinuses

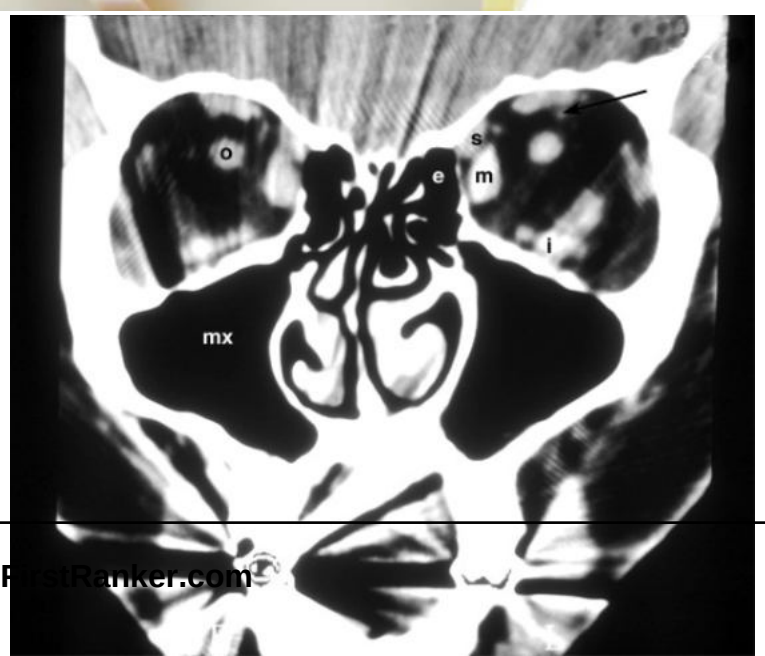






Horizon





- Preseptal cellulitis

- Post Septal cellulitis/Orbital cellulitis

-Orbital cellulitis is purulent inflammation of eye tissues behind the orbital septum

ETIOLOGY

- Extension from neighbouring structures : Parasnasal sinuses, Teeth, Face, Lids, Intracranial cavity, Intraorbital structures

- Exogenous Infection : Foreign body, Penetrating injury, Evisceration, Enucleation, Dacryocystectomy, Orbitotomy

- Endogenous infection : Puerperal sepsis, Thrombophlebitis of leg, Septicemia, rarely as metastasis from Ca Breast

Predisposing factors like Diabetes mellitus and Immunocompromised state also increases risk of infection.

AGENTS

- BACTERIA

•Childrens- Staph aureus, Strep pneumoniae and anaerobics

•Adults- Staph aureus, Strep pneumoniae, E.coli,mixed flora

- FUNGUS

Diabetics and Immunocompromised

Aspergillus, Mucor species

- PARASITE

•Ecchinococcus Granulosus •Taenia solium
•Trichinella spiralis •Toxoplasma gondii

PATHOLOGICAL FEATURES

- Are similar to suppurative inflammations of the body in general, except that

➢Due to the absence of a lymphatic system the protective agents are limited to local phagocytic elements provided by the orbital reticular tissue

➢Due to tight compartments, the intraorbital pressure is raised which augments the virulence of infection causing early and extensive necrotic sloughing of the tissues

➢As in most cases the infection spreads as thrombophlebitis from the surrounding structures, a rapid spread with extensive necrosis is the rule

SYMPTOMS

- High Fever
- Painful swelling of upper and lower lids
- Eyelid appears shiny and is red or purple in color
- Infant or child is acutely ill or toxic
- Eyepain Especially with movement
- Decreased vision
- Eye bulging
- General malaise
- Restricted or painful eye movements

SIGNS

- A marked swelling of the lids characterised by woody hardness and redness
- A marked chemosis of conjunctiva, which may protrude and become desiccated or necrotic
- The eyeball is proptosed axially
- Frequently, there is mild to severe restriction of the
- ocular movements
- Fundus examination may show congestion of retinal veins and signs of papillitis or papilloedem

DIFFERENTIAL DIAGNOSIS

- Cavernous sinus thrombosis
- Endocrine dysfunction
- Orbital myositis
- Orbital pseudotumor
- Wegener granulomatosis

STAGES OF ORBITAL CELLULITIS

- CHANDLER CLASSIFICATION
  - Group 1 - Pre-septal Cellulitis
  - Group 2 - Orbital Cellulitis
  - Group 3 - Subperiosteal abscess
  - Group 4 - Orbital abscess
  - Group 5 - Cavernous sinus thrombosis

INVESTIGATION

- Complete blood count
- Blood culture
- Urine culture
- B scan
- CT Scan
- MRI

TREATMENT

- IV Antibiotics - anti biotic therapy should be continued until patient is apyrexic for 4 days
- Antifungals
- Nasal decongestants
- Diuretics to reduce the IOP
- Lumbar puncture is done in meningeal or lumbar signs develop and It is useful to do the swinging light test to check for a Marcus Gunn pupil, which would indicate optic nerve damage
- Frequent ophthalmic assessment is mandatory in case of intra cranial abscess formation, neurosurgical drainage may be necessary

COMPLICATIONS

- Ocular – Exposure Keratitis , Raised IOP, CRAO, CRVO, Optic Atrophy
- Orbital – Subperiosteal abscess, Orbital abscess
- Cavernous sinous thrombosis
- Meningitis, Brain abscess
- Bacteremia

Cavernous sinus Anatomy

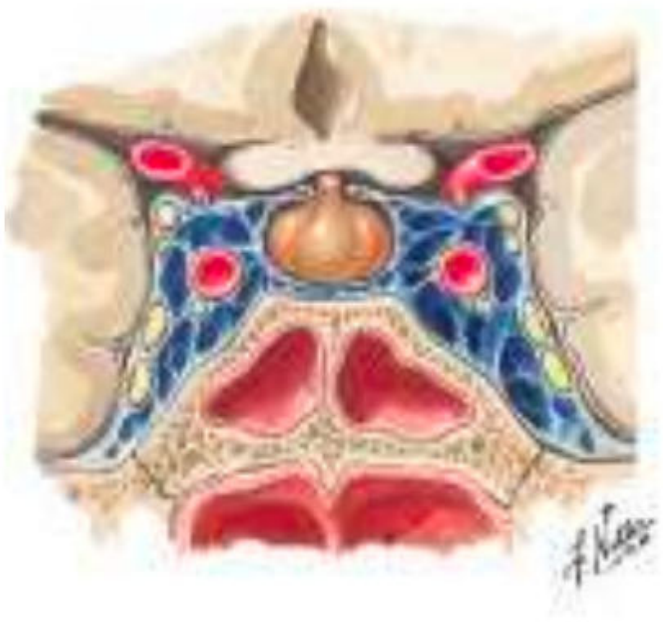
- Large venous space situated in the middle cranial fossa, on either side of body of the sphenoid bone.
- Each sinus is about 2 cm long and 1 cm wide.
- Interior is divided into a number of spaces or caverns by trabeculae.

CAVERNOUS SINOUS THROMBOSIS

Cavernous sinus Anatomy

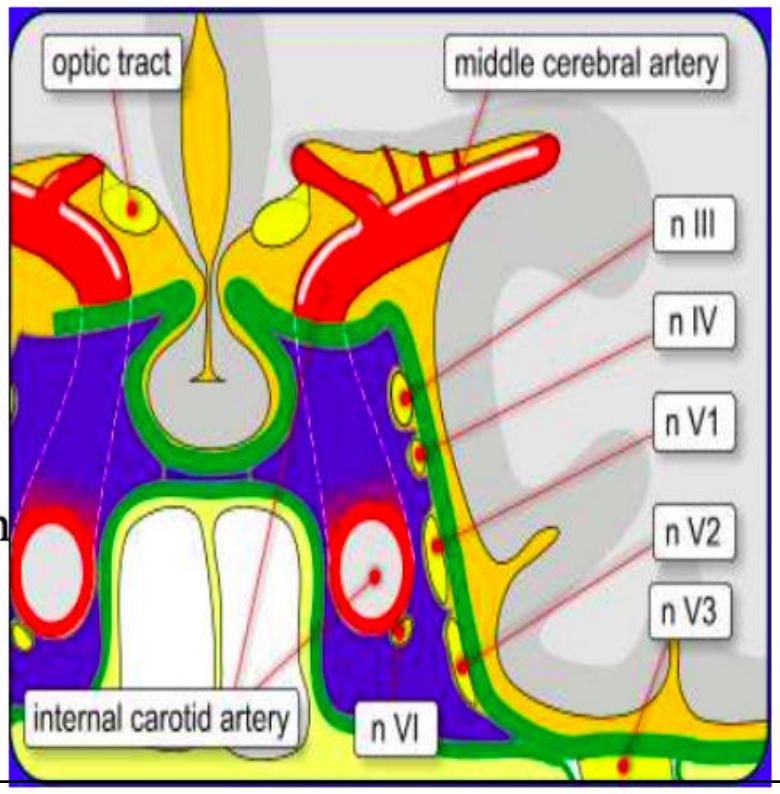
Boundries

- **Anterior -** extends into medial end of superior orbital fissure.
- **Posterior -** upto apex of petrous temporal bone.
- **Medial** – Pitutary above and sphenoid below
- **Lateral** – temporal lobe and uncus
- **Superior** – optic chiasma
- **Inferior** - endosteal dura mater, greater wing of sphenoid



Contents

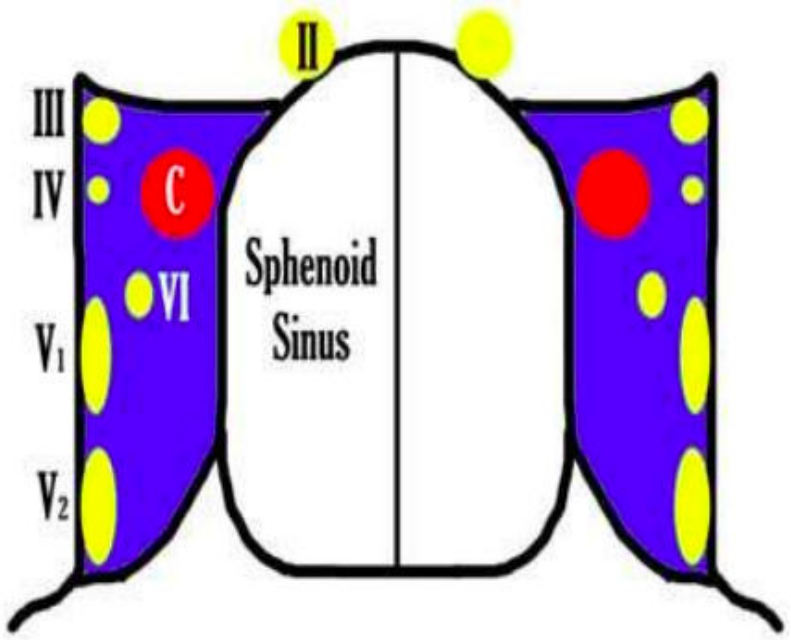
- **Superior to inferior (within the lateral wall of the sinus)**
  - oculomotor nerve (CN III)
  - trochlear nerve (CN IV)
  - ophthalmic nerve, the V_1 branch of the trigeminal nerve (CN V)
  - maxillary nerve, the V_2 branch of CN V



Contents

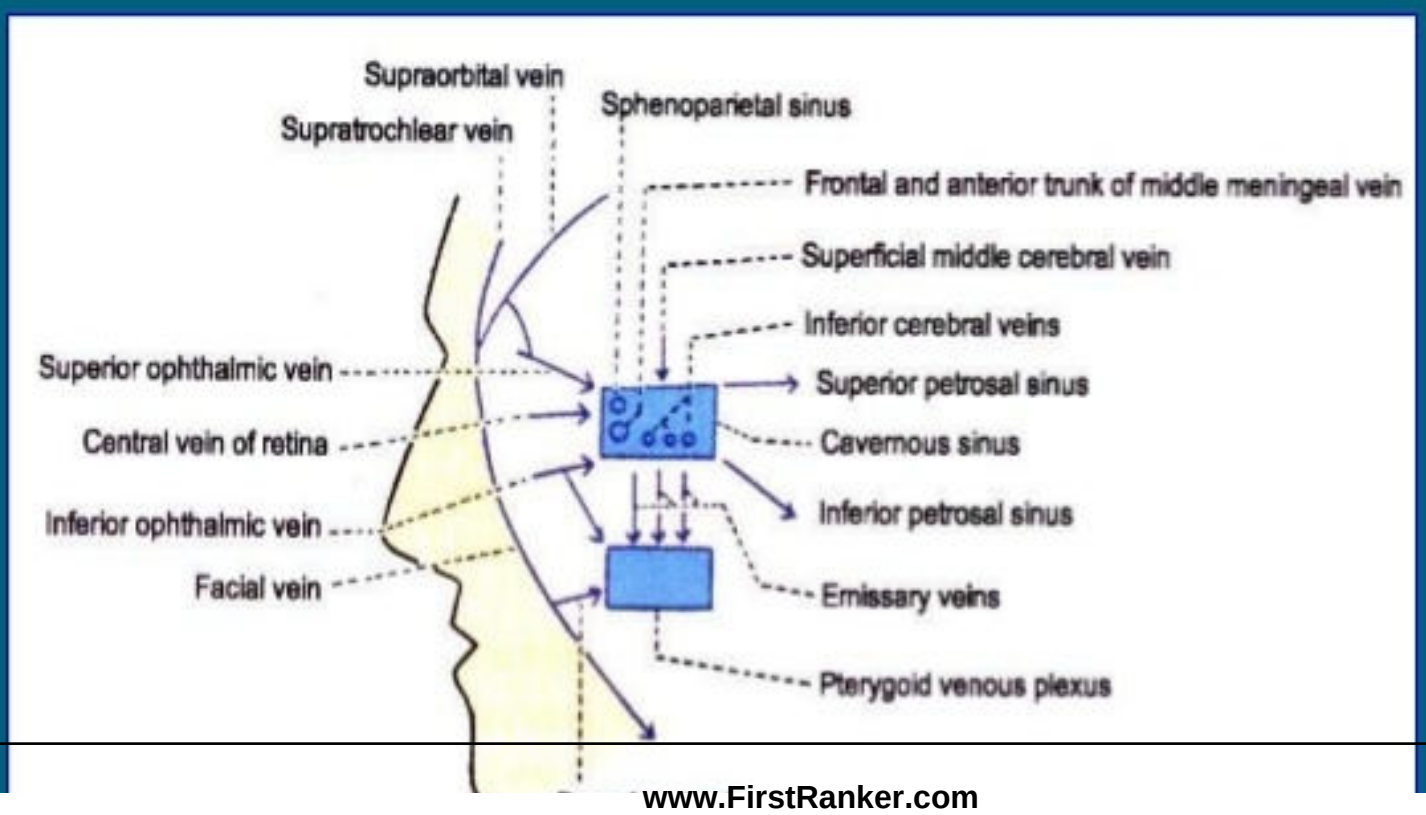
abducens nerve (CN VI) runs through the middle of the sinus alongside the internal carotid artery (with sympathetic plexus)

These nerves, except the CN V_2, pass through the cavernous sinus to enter the orbital apex through the superior orbital fissure.



Communication with:

a) Transverse sinus
b) IJV
c) Pterygoid venous plexus
d) Facial vein
e) Superior sagittal sinus
f) Opposite cavernous sinus



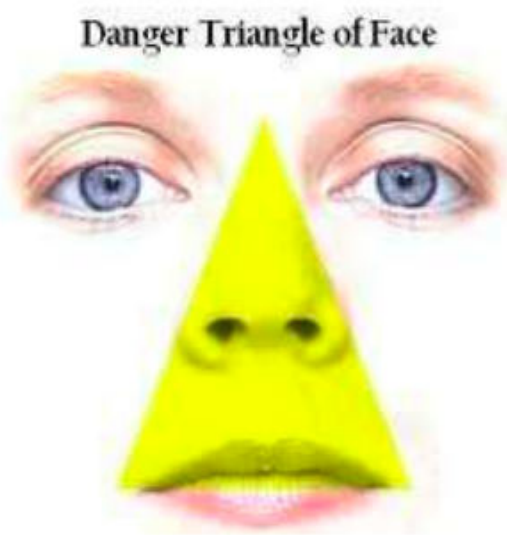
Dangerous area of face

flow of blood in all tributaries & communication are reversible as they possess **no valve**

Spread of infection can lead to thrombosis of cavernous sinus

The cavernous communicate with **dangerous area of face** through 2 routes

- ✓ Superior opthalmic vein
- ✓ Deep facial veins , pterygoid plexus of vein , emissary vein.



Spread of infection to cavernous sinus

1. Infection of the upper lip, vestibule of the nose and eyelids → spread by way of the angular, supraorbital and supratrochlear veins to the ophthalmic veins. Commonest route of infection.
2. Intranasal operations on the septum, turbinates or ethmoid / sphenoid sinus infection → through the ethmoidal veins.

Spread of infection to cavernous sinus

3. Operations on the tonsil, peritonsillar abscess, surgery or osteomyelitis of the maxilla, dental extraction and deep cervical abscess → spread by pterygoid plexus or by direct extension to the internal jugular vein.
4. Involvement of the middle ear and mastoid with lateral sinus phlebitis or thrombosis → retrograde spread through the petrosal sinuses to the cavernous sinus.

Etiology of CST

Septic CST

- **Infectious**

Aseptic CST

Trauma

Postsurgery

- **Rhinoplasty**
- **Cataract extraction**
- **Basal skull (including maxillary)**
- **Tooth extraction**

Hematologic

- **Polycythemia rubra vera**
- **Acute lymphocytic leukemia**

Malignancy

- **Nasopharyngeal tumor**

Other

- **Ulcerative colitis**
- **Dehydration**

Septic cavernous sinus thrombosis

- Most commonly results from contiguous spread of infection from the nose (50%), sphenoidal or ethmoidal sinuses (30%) and dental infections (10%).
- *Staphylococcus aureus* is the most common - found in 70% of the cases.
- *Streptococcus* is the second leading cause.
- Gram-negative rods and anaerobes may also lead to cavernous sinus thrombosis.
- Rarely *Aspergillus fumigatus* and mucormycosis.

Cavernous Sinus thrombosis

Characterized by multiple cranial neuropathies

Clinical feature -

- ✓ General feature of infection – fever , rigors ,malaise, and severe frontal & periorbital pain.
- ✓ U/L exopthalmos & tender eye ball
- ✓ Oedema of eyelid & chemosis of conjuctiva

Oculomotor feature –

- ✓ External opthalmoplegia
- ✓ Ptosis
- ✓ Slight exopthalmos
- ✓ dilated pupil with loss of accomdation reflex

Cavernous Sinus thrombosis

- Impairment of ocular motor nerves, Horner's syndrome and sensory loss of the first or second divisions of the trigeminal nerve in various combination
- **The pupil may be involved or spared or may appear spared with concomitant oculosympathetic involvement.**

Occular manifestation of cavernous sinus thrombosis

SIGN	*INVOLVED STRUCTURES*
Ptosis	Edema of upper eye lid Sympathetic plexus III cranial nerve
Chemosis	Thrombosis of superior and inferior ophthalamic vein
Proptosis	Venous engorgement
Sensory loss/ Periorbital pain	V cranial nerve
Corneal ulcers	Corneal exposure due to proptosis
Lateral rectus palsy	VI cranial nerve
Complete ophthalmoplegia	CN II, IV, VI
Decreased visual acuity or blindness	Central retinal artery/ vein occlusion secondary to ICA arteritis, septic emboli, ischemic optic neuropathy

Complication of Cavernous Sinus thrombosis

- Intracranial extension of infection may result in meningitis, encephalitis, brain abscess, pituitary infection, and epidural and subdural empyema.
- Cortical vein thrombosis can result in hemorrhagic infarction.
- Extension of the thrombus to other sinuses can occur.

TREATMENT OF CAVERNOUS SINUS THROMBOSIS

Septic cavernous sinus thrombosis –

- The mainstay of therapy is early and aggressive antibiotic administration.
- Although *S aureus* is the usual cause, broad-spectrum coverage for gram-positive, gram-negative, and anaerobic organisms should be instituted pending the outcome of cultures.
- Empiric antibiotic therapy should include a penicillinase-resistant penicillin plus a third generation cephalosporin.
- Vancomycin may be added for MRSA.
- IV antibiotics are recommended for a minimum of 3-4 weeks.

TREATMENT OF CAVERNOUS SINUS THROMBOSIS

- A Cochrane review found 2 small trials involving 79 patients who were treated with anticoagulants.
- Limited evidence suggests anticoagulant drugs are probably safe and may be beneficial for people with sinus thrombosis.
- Anticoagulation carries a significant risk of hemorrhage if cortical venous infarction or necrosis of intracavernous portions of the carotid artery are present.
- Anticoagulant is contraindicated in the presence of intracerebral hemorrhage or other bleeding diathesis.

Prognosis

- 100% mortality prior to effective antimicrobials
- Typically, death is due to sepsis or central nervous system (CNS) infection.
- With aggressive management, the mortality rate is now less than 30%.
- Morbidity, however, remains high, and complete recovery is rare.
- Roughly one sixth of patients are left with some degree of visual impairment, and one half (50 %) have cranial nerve deficits.

Fungal infection

- Intracranial extension is the most dreaded complication of fungal sinusitis with high mortality rates.
- Aspergillus is the most common.
- Mucor, rhizopus, cladosporium, candida, cryptococcus are amongst the others.
- Mode of spread =

  Hematogenous spread

  Direct extension

Fungal infection - treatment

- Line of management-included debridement, clearing of disease from the sinuses and antifungal therapy with systemic Amphotericin B.
- In combined therapeutic modality, surgery + amphotericin B, the overall survival rate is 81%.
- It is 89% in diabetics with combined therapy and corrected ketoacidosis.