

DEVELOPMENT

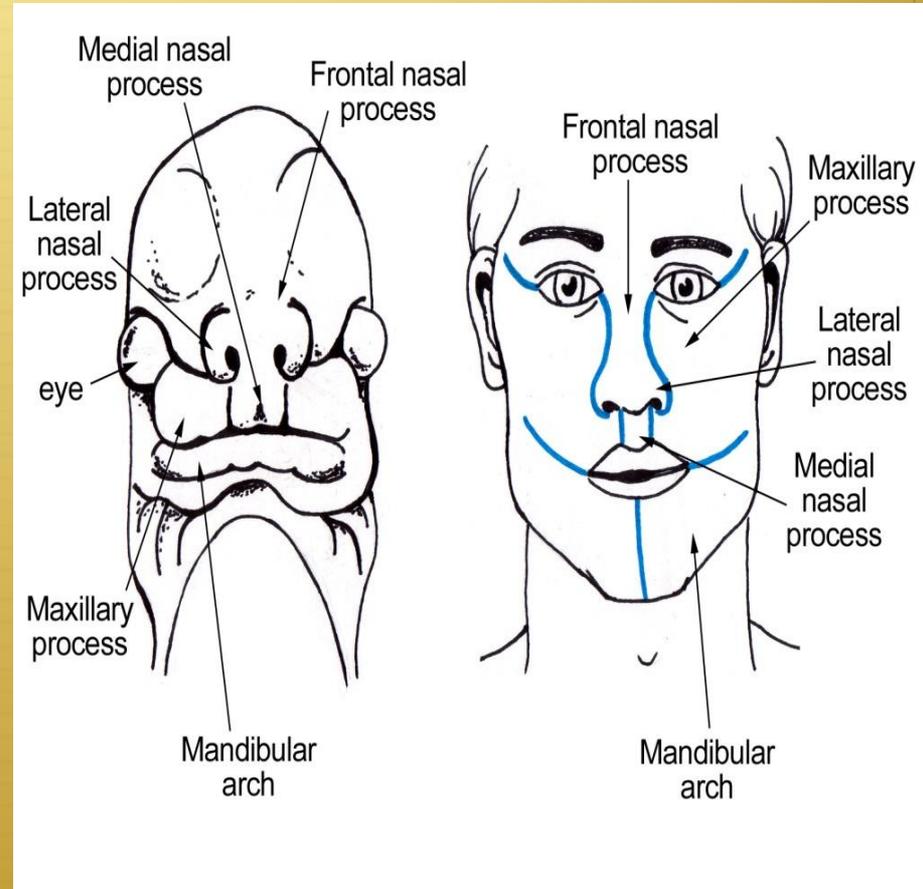
- ✦ Orbit develops around the eyeball
- ✦ Orbital walls- derived from cranial neural crest cells which expand to form

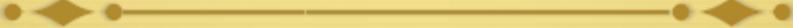
Frontonasal process

Maxillary process

- ✦ Lateral nasal process + Maxillary process = medial, inferior and lateral orbital walls

- ✦ Capsule of forebrain forms orbital roof



- 
- ✦ bones differentiate during the 3rd month and later undergo ossification.
 - ✦ Ossification by enchondral or membranous type
 - ✦ Frontal, Zygomatic, Maxillary and Palatine bones- Intramembranous origin
 - ✦ Sphenoid bone- both enchondral and intramembranous origins
 - ✦ Although eyeball reaches the adult size by 3 years of age, orbit undergoes considerable alterations in size and shape and grows progressively till puberty.

CHANGES IN ORBIT WITH AGE

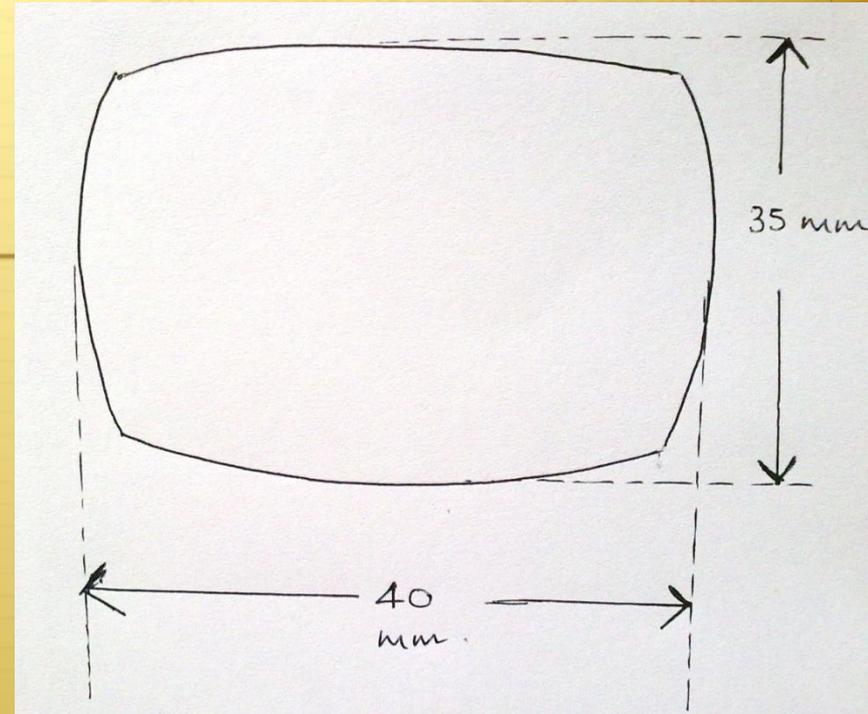
	Shape	Height	Width	Index
Fetus	Oval	14mm	18mm	77.7
Newborn	Round	27mm	27mm	100
7 years	Quadrilat.	28mm	33mm	84.4
Adult	Quadrilat.	35mm	40mm	89.2

ANATOMY



- ✦ Orbits are quadrangular truncated pyramidal in shape
- ✦ Bounded:
 - ✦ Superiorly – Anterior cranial fossa
 - ✦ Medially - Nasal cavity & Ethmoidal air sinuses
 - ✦ Inferiorly - Maxillary sinus
 - ✦ Laterally - Middle cranial fossa & Temporal fossa

DIMENSIONS



- ✦ Volume: 30 ml
- ✦ Rim: horizontally 40 mm and vertically 35 mm
- ✦ Intra orbital width: 25mm
- ✦ Extra orbital width: 100mm
- ✦ Depth : medially 42mm, laterally 50 mm

✦ Each orbit is made up of 7 bones

✦ Frontal

✦ Ethmoidal

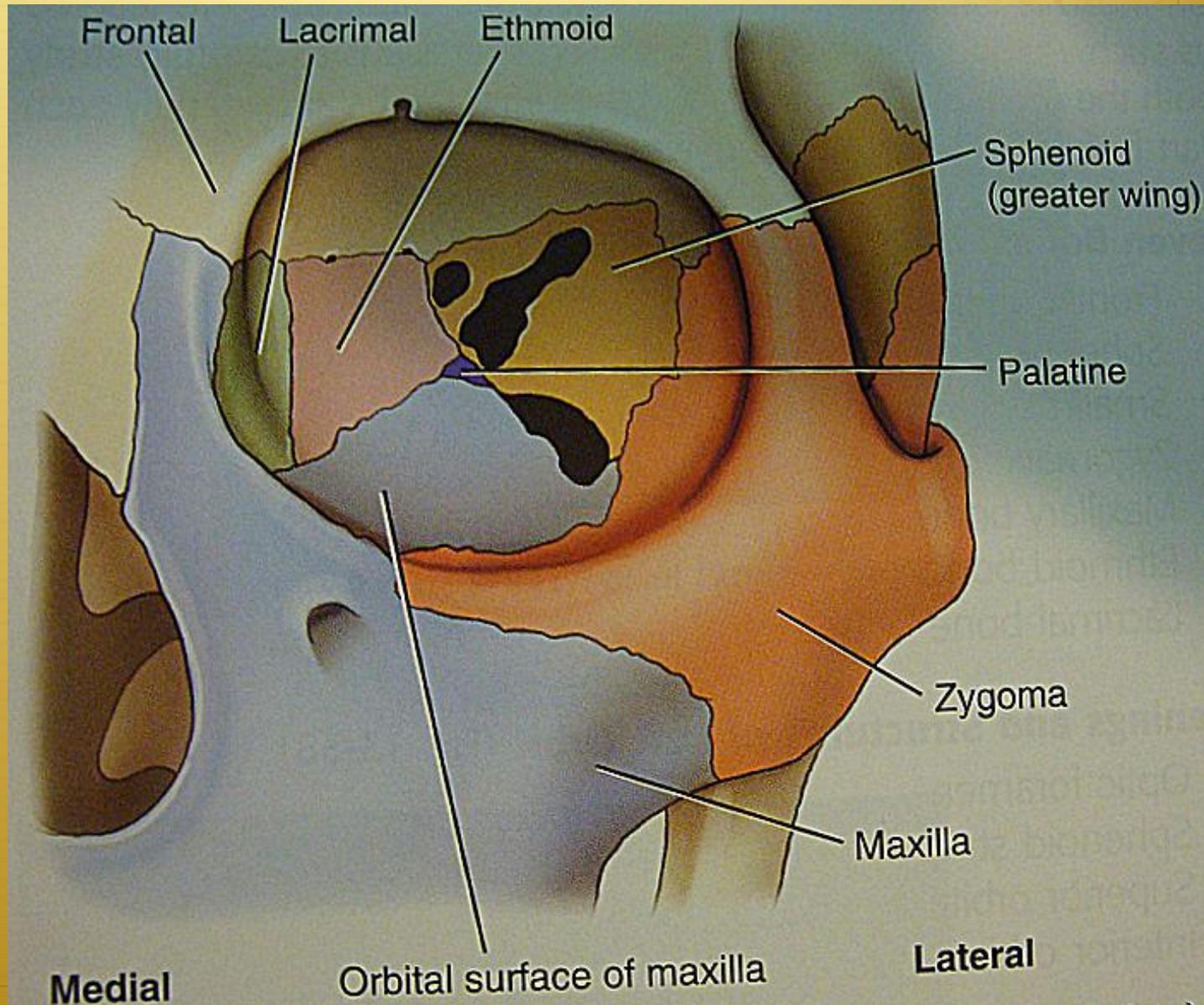
✦ Maxillary

✦ Lacrimal

✦ Zygomatic

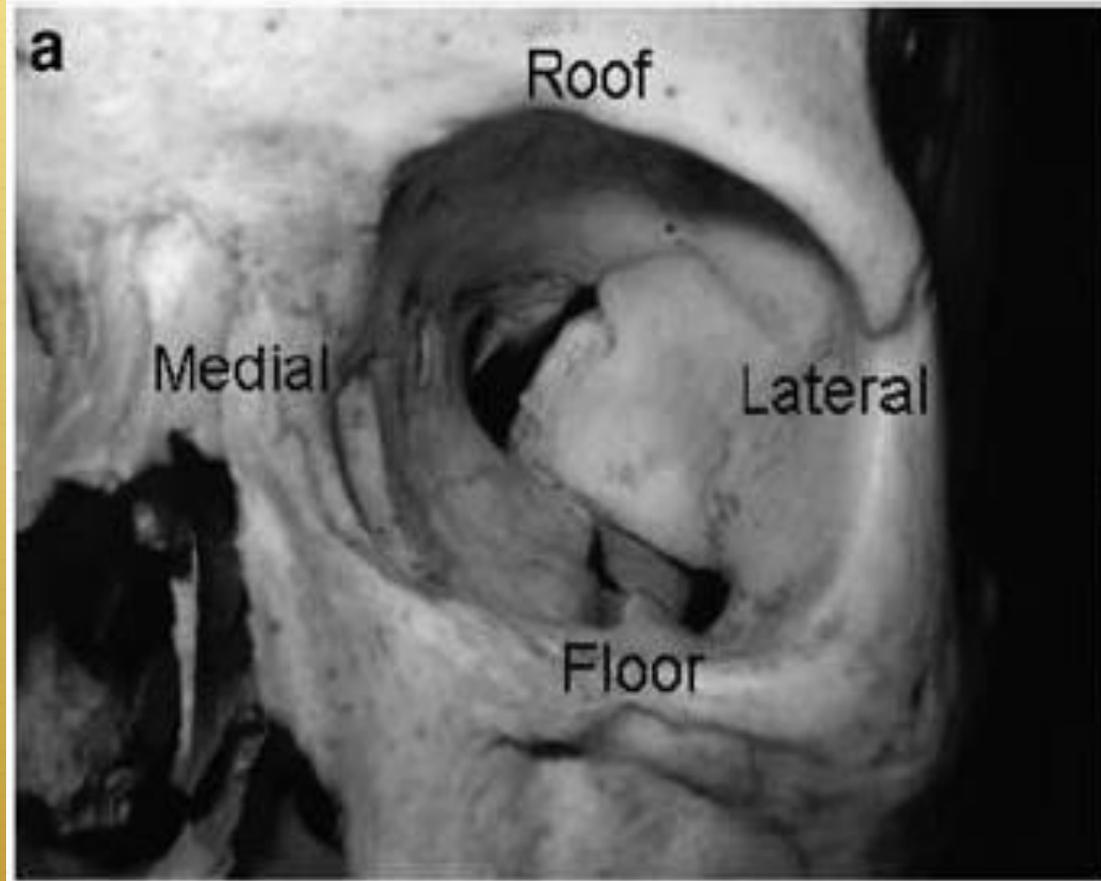
✦ Sphenoid

✦ Palatine



WALLS OF THE ORBIT

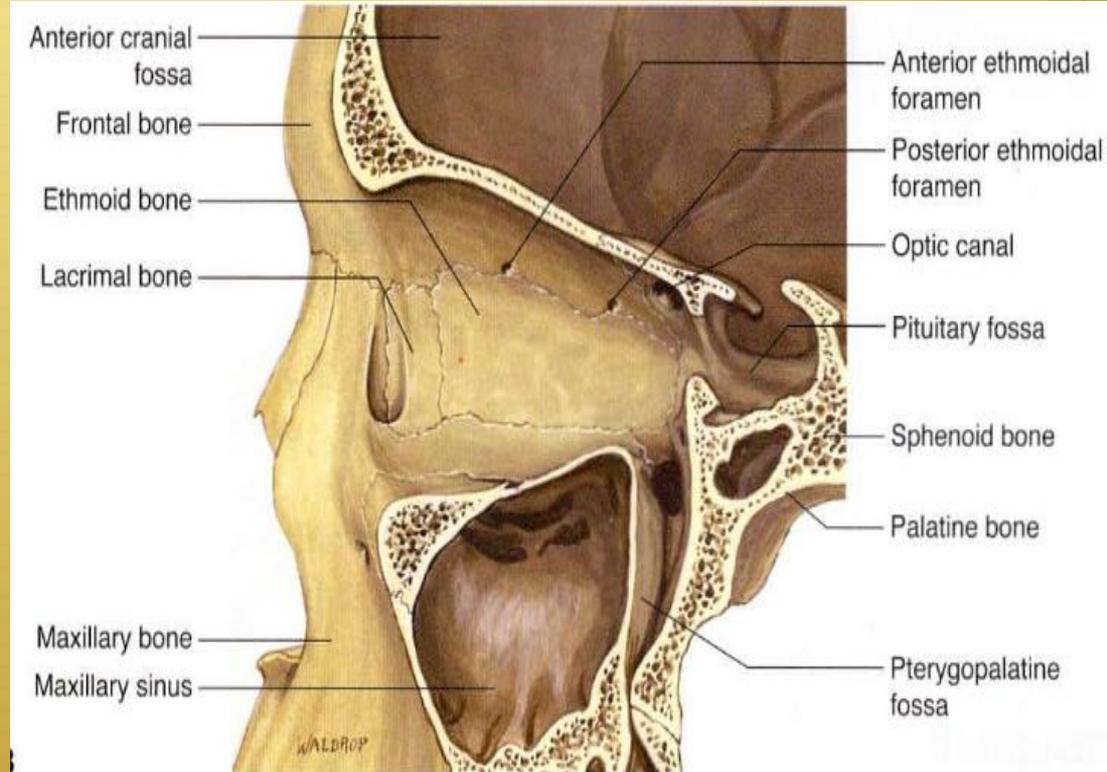
- ✦ Medial
- ✦ Lateral
- ✦ Floor
- ✦ Roof



MEDIAL WALL

Formed(Antero-posteriorly)

- ✦ 1. Frontal process of Maxilla
- ✦ 2. Lacrimal bone
- ✦ 3. Orbital plate of Ethmoid
- ✦ 4. Body of the sphenoid



CONTD...



- ✦ Thinnest orbital wall:0.2-0.4mm thick
- ✦ Are spaced 2.5cms apart.
- ✦ Parallel to each other.
- ✦ Measures about 4.4 to 5cm
- ✦ Majority of it is formed by Lamina papyracea

LAND MARKS

1. LACRIMAL FOSSA

- ✦ Forms the anterior part of medial wall.
- ✦ Formed by frontal process of maxilla and lacrimal bone.
- ✦ Contains the lacrimal sac.
- ✦ Bounded by anterior and posterior lacrimal crests
- ✦ Medial to lac fossa upper part has ant ethmoidal sinus and lower part has middle meatus of nose
- ✦ Just behind post lacrimal crest attachment of horner's muscle, check ligament of MR and septum orbitale

2. Anterior and posterior ethmoidal foramen

3. WEBERS SUTURE-infra orbital artery

APPLIED ANATOMY

- ✦ Since it is thinnest, ethmoiditis is the commonest cause of orbital cellulitis, especially in children.
- ✦ Frequently eroded by chronic inflammatory lesions, neoplasms, cysts.
- ✦ It is easily fractured during trauma and during orbitotomy operations.
- ✦ Hemorrhage can occur due to trauma to ethmoidal vessels.

- ✦ Accidental lateral displacement of medial wall-
traumatic hypertelorism
- ✦ Medial wall provides alternate access route to the orbit
through the sinus
- ✦ Lacrimal bone can be easily penetrated during
endoscopic DCR

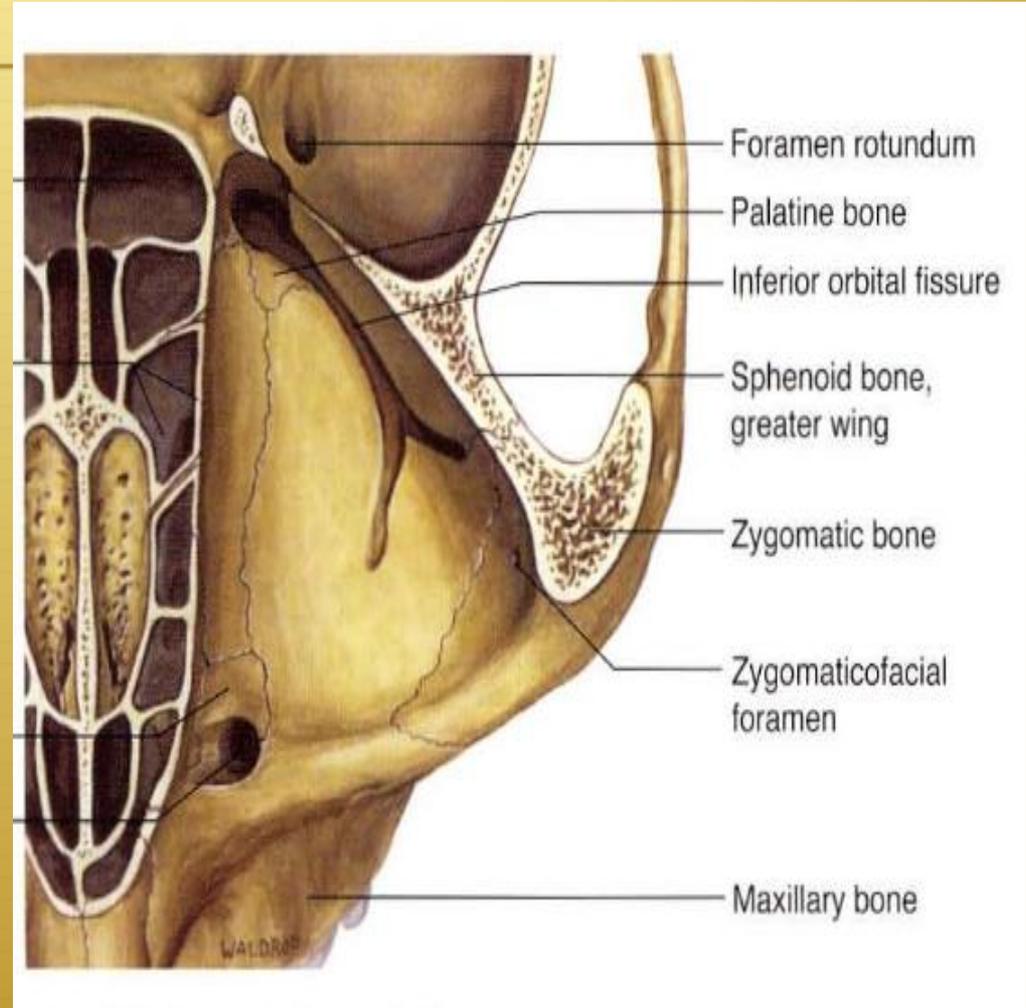
FLOOR

✦ Formed by:

Maxillary bone medially

Zygomatic bone laterally

Palatine bone posteriorly



- 
- ✦ Triangular in shape.
 - ✦ Slopes downward and laterally
 - ✦ Shortest orbital WALL
 - ✦ Bordered laterally by inferior orbital fissure and medially by maxilloethmoidal suture
 - ✦ Overlies maxillary sinus

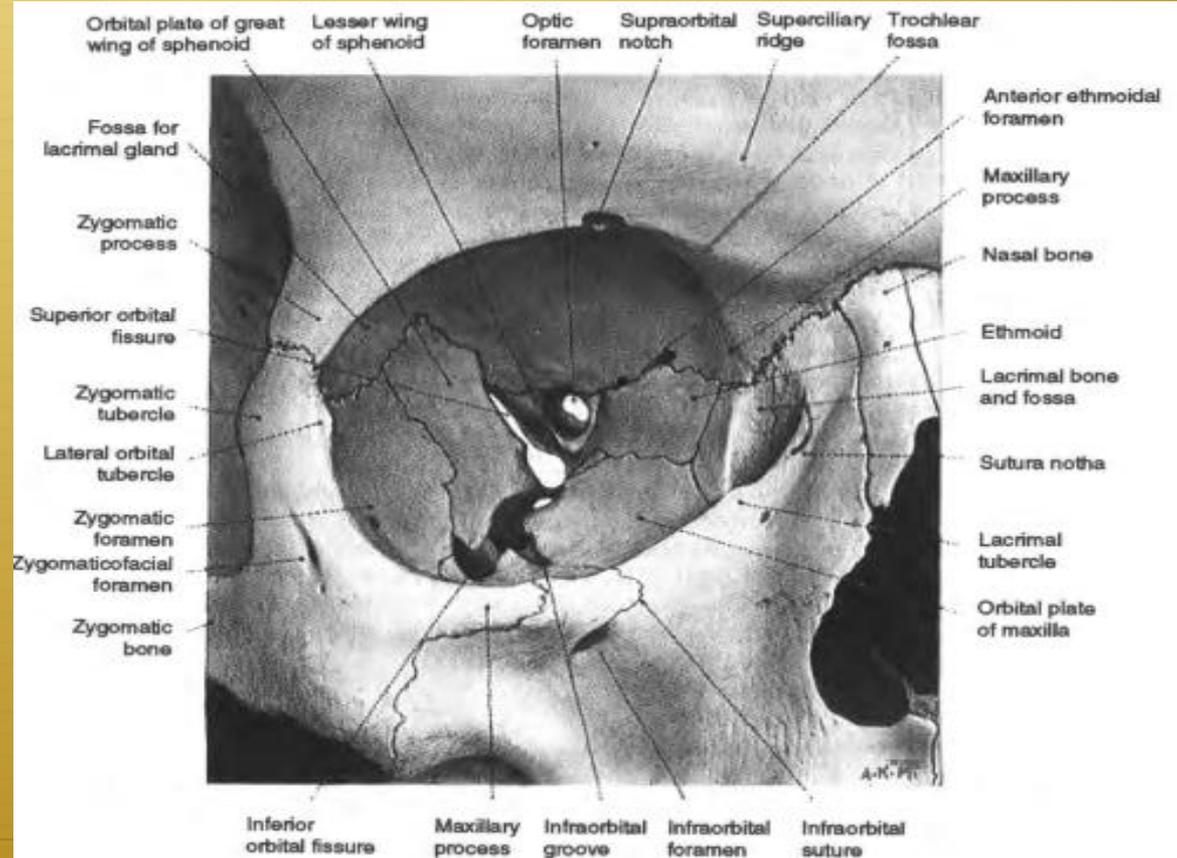
LAND MARKS

INFRA
ORBITAL
GROOVE

INFRA
ORBITAL
CANAL

INFRA
ORBITAL
FORAMEN

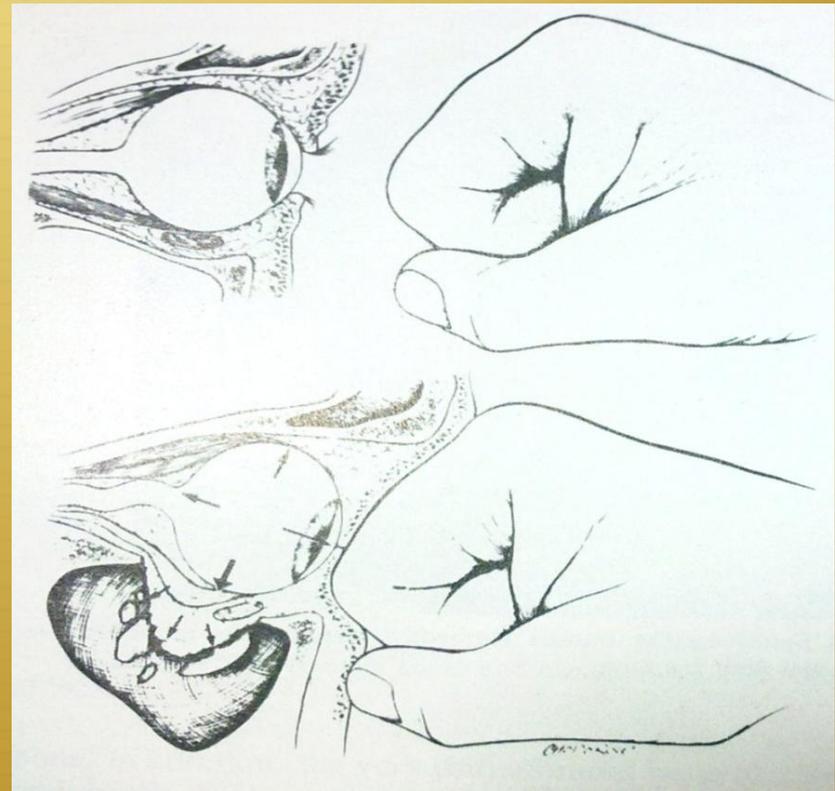
- ≈ 4 mm inferior to the inferior orbital margin
- Transmits
 - Infraorbital nerve
 - Infraorbital vessels



APPLIED ANATOMY

Commonly involved in BLOW OUT FRACTURES OF THE ORBIT. infra orbital vessels and nerves almost always involved

- ✦ Easily invaded by tumours of the maxillary antrum.



LATERAL WALL

- ✦ Triangular, makes 45° with medial plane

- ✦ Formed by two bones

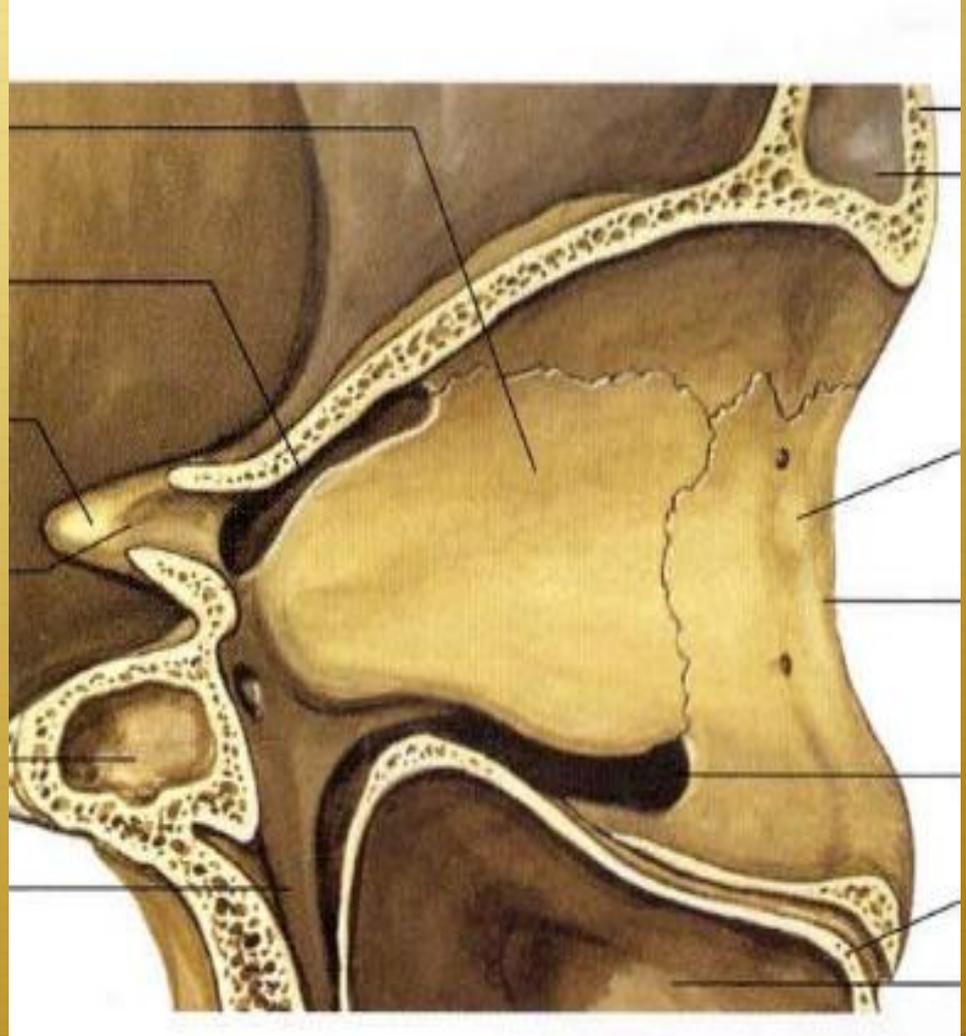
Ant zygomatic bone

Post greater wing of sphenoid

- ✦ Separates orbit from-

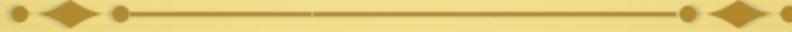
- ✦ Middle cranial fossa

- ✦ Temporal fossa



LAND MARKS

✦ Sphenoid area separates from roof and floor by sup and inf orbital fissures



✦ Zygomatic merges with floor and joins the roof at front to form *zygomatic suture*

✦ More anterior wall is transversed by *zygomatic groove and foramina*(zygo vessels and N. pass through)

✦ Ant part of the wall projection ***TUBERCLE OF WHITNALL***, gives attachment to check ligaments of lateral rectus and susp ligaments of eye ball.

✦ In maxillary resection if tubercle of whitnall damaged causes diplopia

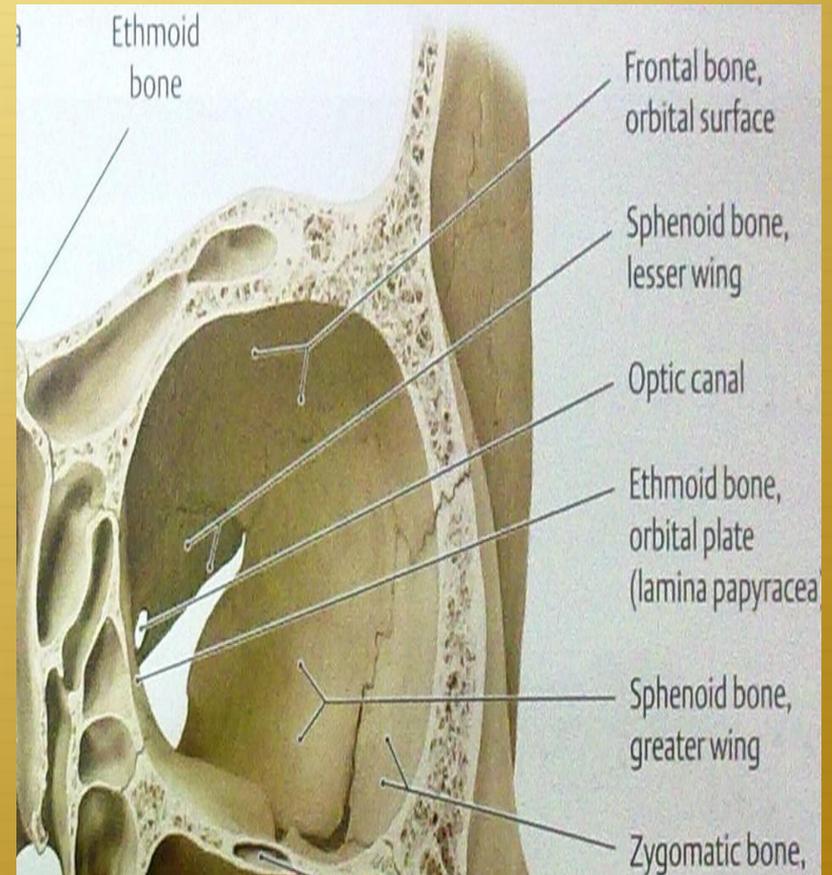
APPLIED ANATOMY



- ✦ Protects only the posterior part of globe, Hence palpation of retrobulbar tumours is easier from lateral side than nasal.
- ✦ Since lateral wall is almost devoid of foramina, bleeding is less.
- ✦ The Zygomatico-Sphenoid suture important landmark in creating the flap in lateral orbitotomy

ROOF

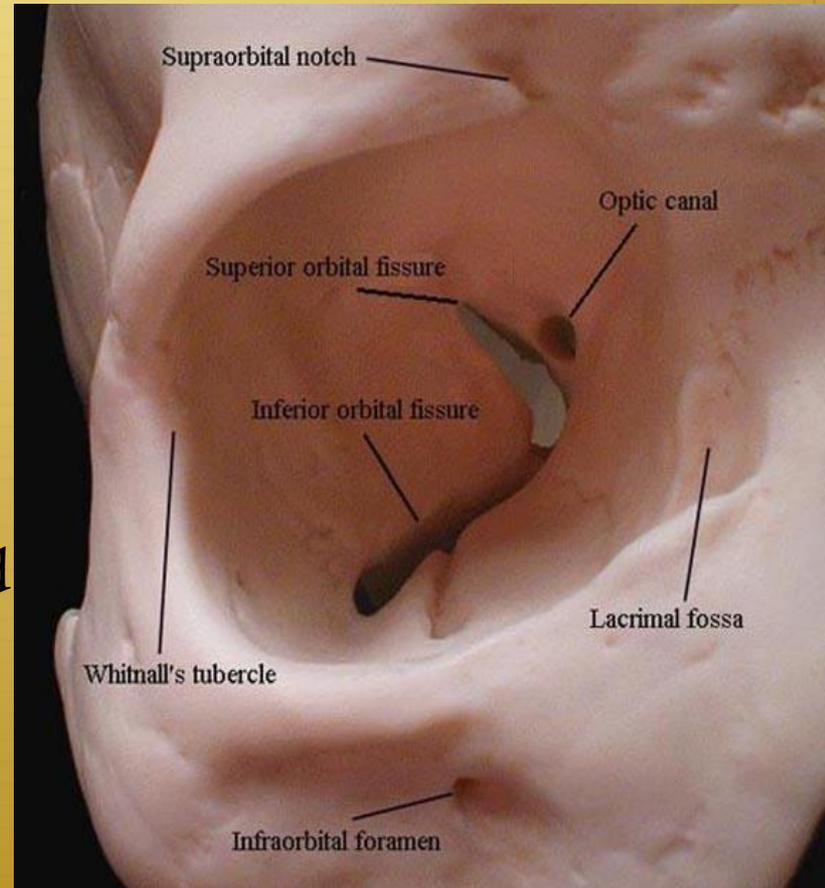
- ✦ Underlies Frontal sinus and Anterior cranial fossa
- ✦ Formed by-
 - ✦ 1. Frontal bone (Orbital plate)
 - ✦ 2. Lesser wing of Sphenoid
- ✦ Triangular
- ✦ Faces downwards, and slightly forwards



LAND MARKS

1. SUPRAORBITAL NOTCH:

- LOCATION:
 - ≈15 mm lateral to the superomedial angle
- TRANSMITS:
 - Supraorbital nerve
 - Supraorbital vessels
- SURFACE ANATOMY:
 - At the junction of lateral 2/3rd and medial 1/3rd
 - About two finger breadth from the medial plane



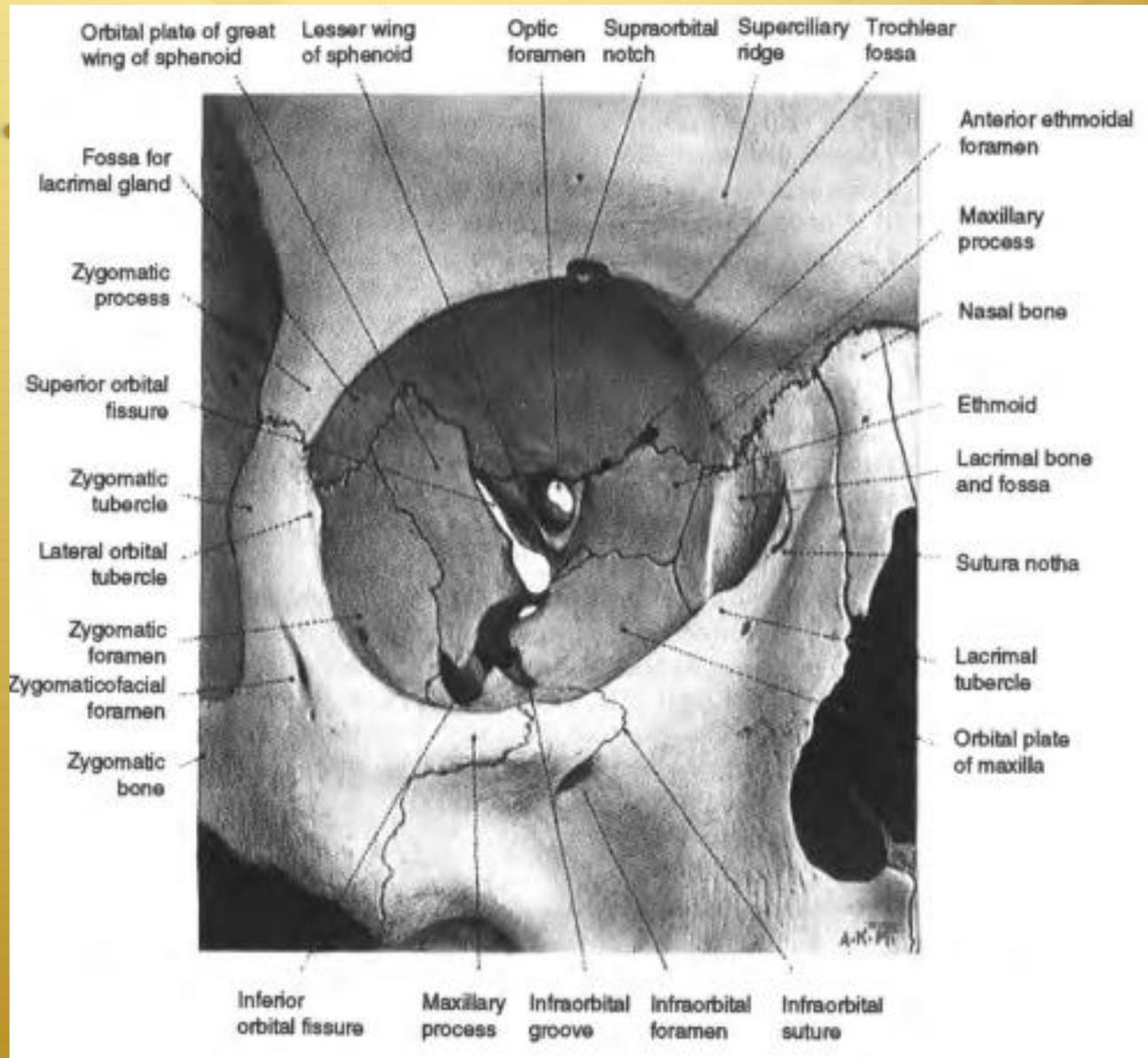
APPLIED ANATOMY

- Thin and periorbita peels away easily
- Objects piercing upper eyelid penetrate roof and damage frontal lobe
- No major blood vessels present can be easily nibbed in transfrontal orbitotomy
- At the junction of roof and medial wall the suture line lies in proximity to cribriform plate of ethmoid. Any trauma rupture of dura mater AND CSF escapes into orbit/nose/both

ORBITAL MARGINS

4 MARGINS:

- Superior ,
- lateral ,
- medial
- inferior



APPLIED ANATOMY

- 
- ✦ SUPERIOR- Supra orbital notch site for nerve block
 - ✦ LATERAL -fronto zygomatic suture Prone for separation following blunt trauma
 - ✦ INFERIOR-At the junction of lateral 2/3rd & medial 1/3rd just within the rim- small depression- origin of Inferior oblique Prone to fracture and diplopia

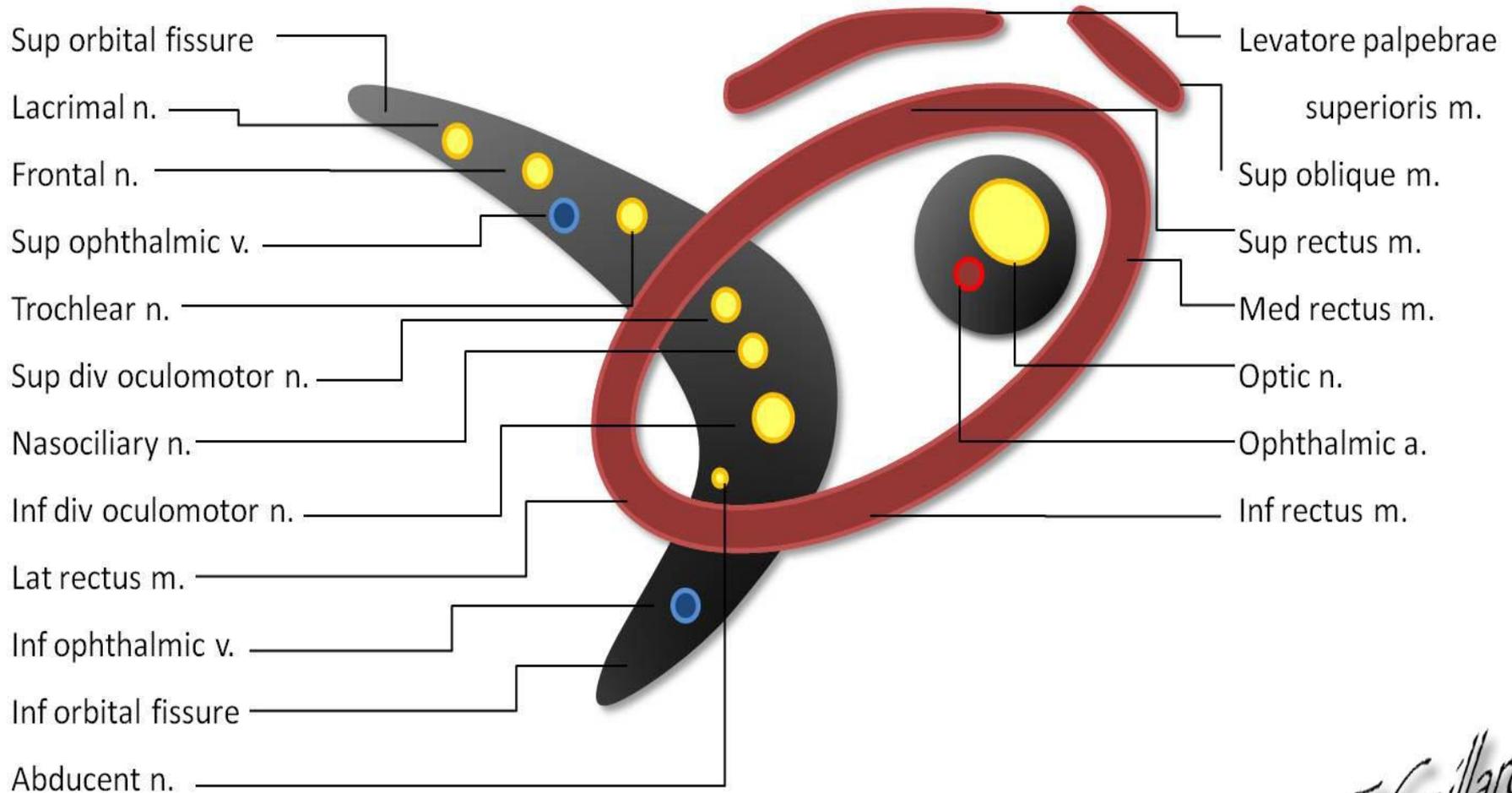
APEX OF THE ORBIT

OPTIC CANAL and SUP ORBITAL FISSURE

OPTIC CANAL

- ✦ It transmits the optic nerve (with its meninges) and ophthalmic artery.
- ✦ Average length is 6 to 11mm.
- ✦ It connects the orbit to the middle cranial fossa.
- ✦ Adult dimensions are achieved by 4-5yrs
- ✦ Optic nerve glioma or Meningioma may lead to unilateral enlargement of Optic canal

SUPERIOR ORBITAL FISSURE



*FGaillard
2007*



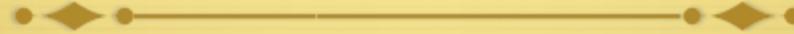
- ✦ It is a comma shaped aperture in the orbital cavity.
- ✦ It is bounded by greater and lesser wings of sphenoid.
- ✦ It is situated lateral to optic canal.
- ✦ It is divided into upper, middle and lower parts by common tendinous ring.

APPLIED ANATOMY



- ✦ **TOLOSA HUNT SYNDROME**-Inflammation of the superior orbital fissure and apex may result in a multitude of signs including ophthalmoplegia and venous outflow obstruction
- ✦ **SUPERIOR ORBITAL SYNDROME**-Fracture at superior orbital fissure → Involvement of cranial nerves → Diplopia, Ophthalmoplegia, Exophthalmos, Ptosis

CONNECTIVE TISSUE SYSTEM



- ✦ Periorbita
- ✦ Orbital septal system
- ✦ Tenon's capsule

PERIORBITA

- ✦ Loosely adherent to the bones
- ✦ Sensory innervation by branches of V'th nerve
- ✦ Fixed firmly at
 - Orbital margins (Arcus marginale)
 - Suture lines
 - Various fissures & foramina
 - Lacrimal fossa

APPLIED ANATOMY-Surgery in the orbital roof in the areas of fissures and suture lines may be complicated by cerebrospinal fluid leakage .

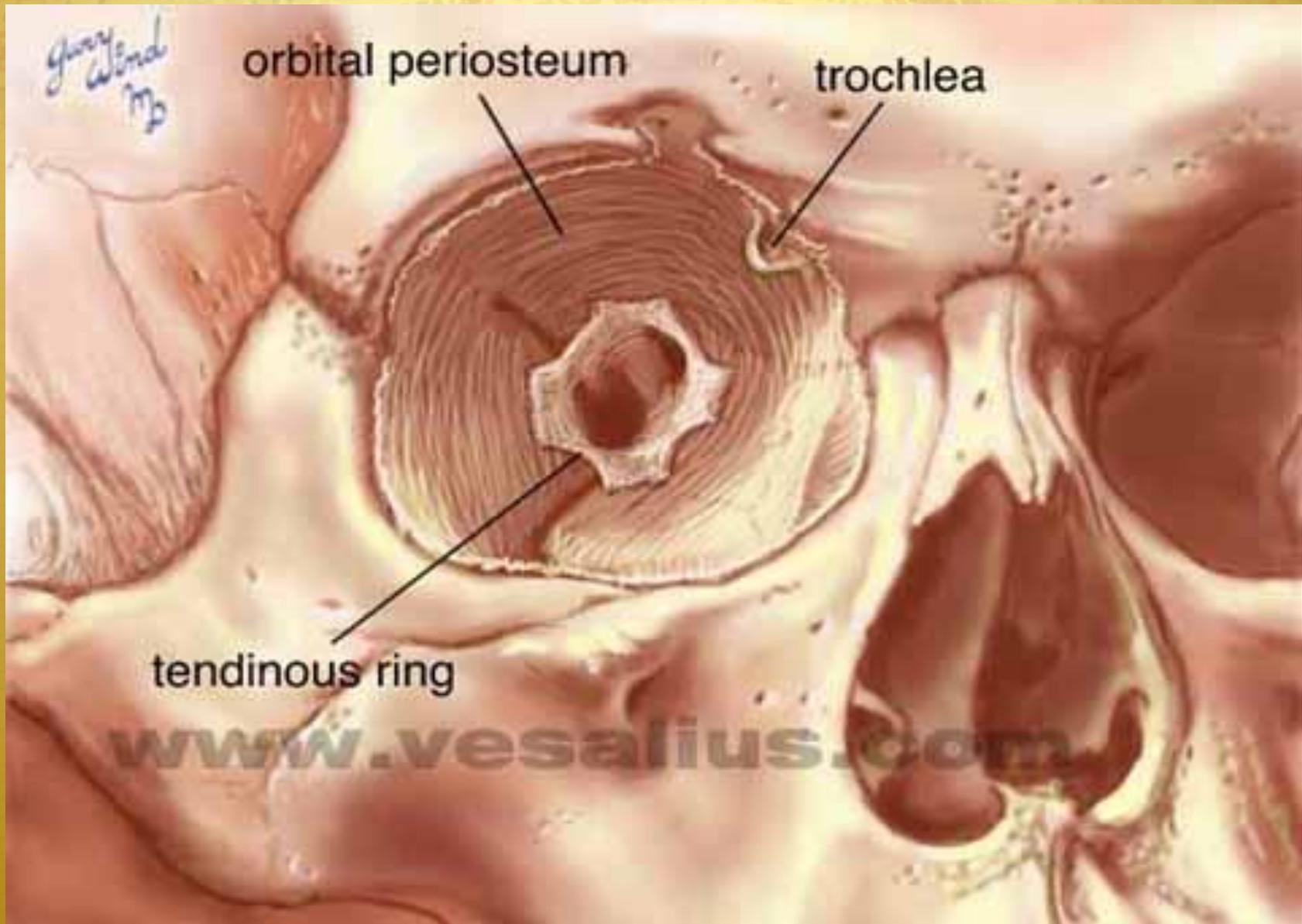
Gray
Wind
MP

orbital periosteum

trochlea

tendinous ring

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ORBITAL SEPTAL SYSTEM



- ✦ Includes the connective tissue septa which are suspended from the periorbita to form a complex radial and circumferential interconnecting slings.
- ✦ These septa surround Extraocular muscles, Optic nerve, neuro-vascular elements and the fat lobules.

TENON'S CAPSULE



- ✦ Also known as Fascia bulbi or bulbar sheath.
- ✦ Dense, elastic and vascular connective tissue that surrounds the globe (except over the cornea).
- ✦ Begins anteriorly at the perilimbal sclera, extends around the globe to the optic nerve, and fuses with the dural sheath and the sclera.
- ✦ Separated from the sclera by periscleral lymph space, which is in continuation with subdural and subarachnoid spaces.

CONTENTS OF THE ORBIT

✦ Eye ball

✦ Muscles

✦ 4 Recti

✦ 2 obliques

✦ Levator palpebrae superioris

✦ Muller's muscle (Musculus orbitalis)

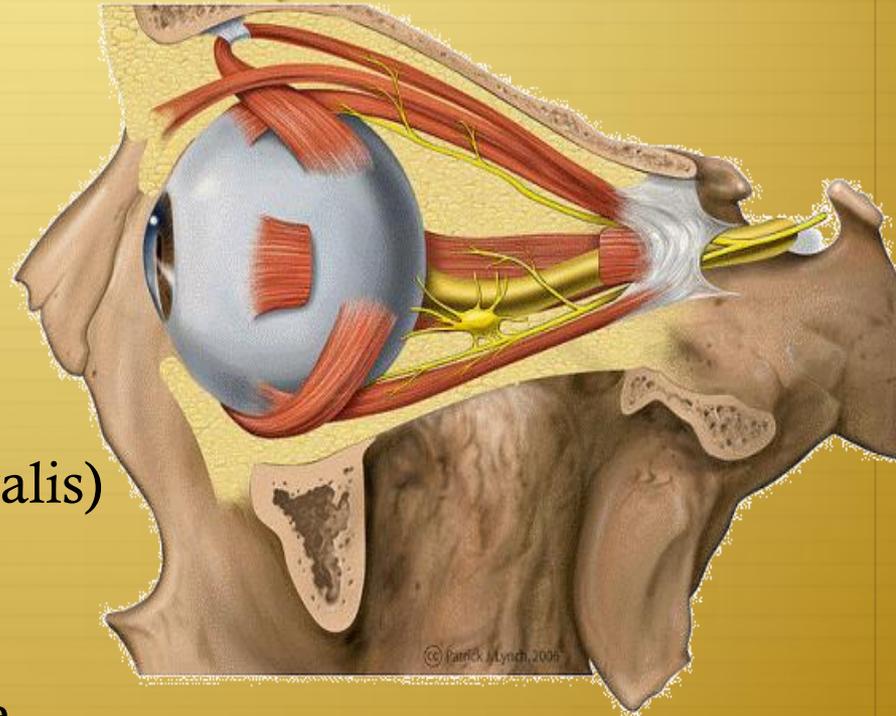
✦ Nerves

✦ Sensory- branches of V'th Nerve

✦ Motor- III'rd, IV'th & VI'th Nerve

✦ Autonomic- N. to the Lacrimal gland

✦ Ciliary ganglion



✦ Vessels

✦ Arteries-

- ✦ Internal carotid system- branches of ophthalmic artery
- ✦ External carotid system- a branch of internal maxillary artery

✦ Veins-

- ✦ Superior ophthalmic vein
- ✦ Inferior ophthalmic vein

✦ Lymphatics-

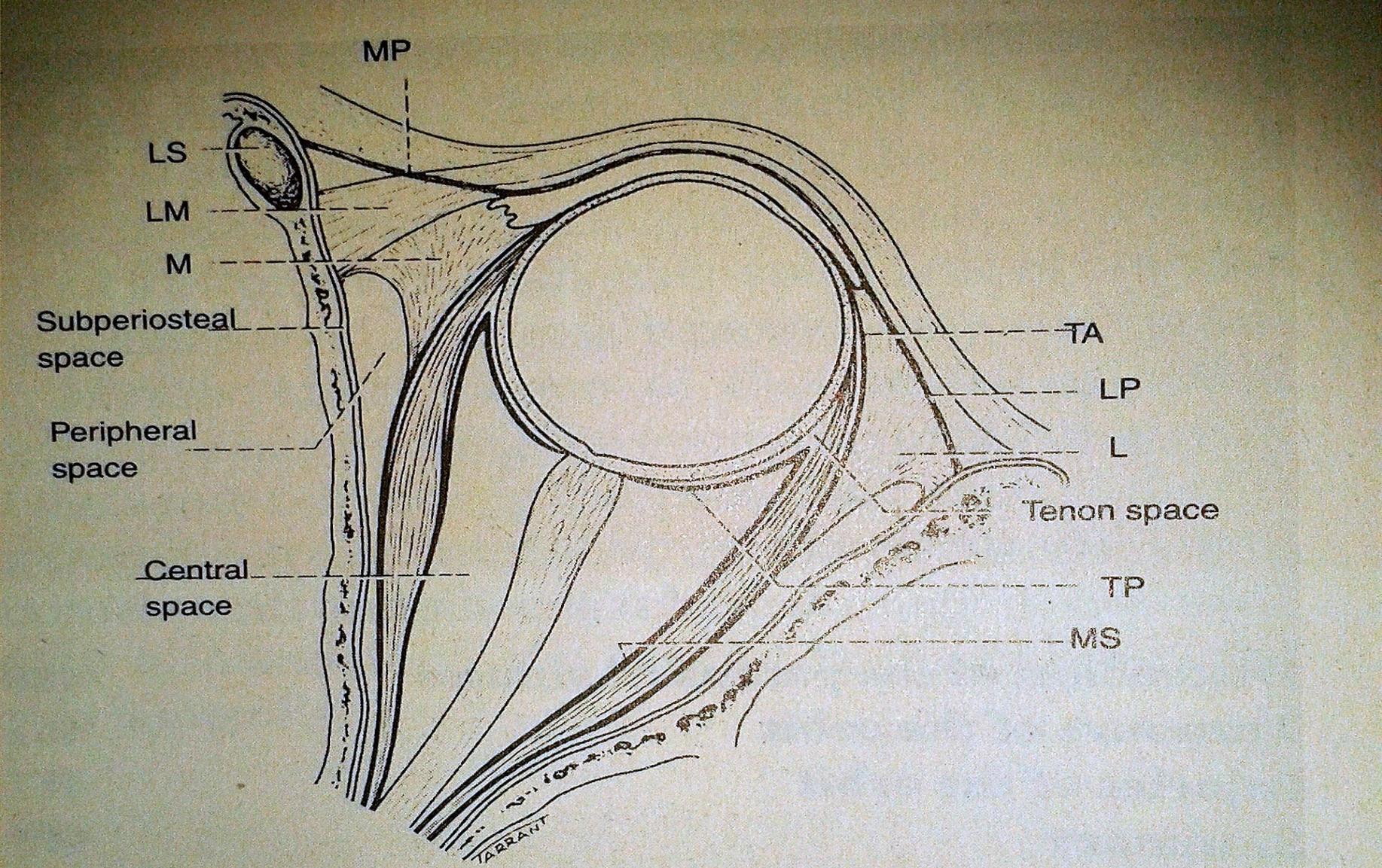
- ✦ none

✦ Lacrimal gland

✦ Lacrimal sac

✦ Orbital fat, reticular tissue & orbital fascia

SURGICAL SPACES OF THE ORBIT



SUBPERIOSTEAL SPACE:

- Potential space between the periorbita and the orbital bones,

- limited anteriorly by the strong adhesions of periorbita and orbital bones

SUBTENON'S SPACE

- ✦ Potential space around the eyeball between the tenons and the sclera.
- ✦ Anterior and posterior subtenons injections are given.
- ✦ Abscesses are drained by incising the conjunctiva.

✦ PERIPHERAL ORBITAL SPACE

Bounded:

- peripherally by periorbita
- internally by the four recti with their intermuscular septa
- anteriorly by the septum orbitale
- Posteriorly, it merges with the central space

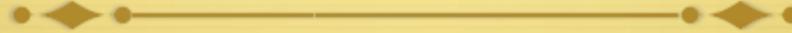
Applied anatomy

- ✦ Peribulbar block is given
- ✦ Tumours produce eccentric proptosis
- ✦ Common tumours: capillary hemangioma, Lymphoma, Lacrimal gland tumours and Pseudotumours

CONTENTS

- ✦ Peripheral orbital fat
- ✦ Muscles
 - ✦ SO,IO,LPS
- ✦ Nerves
 - ✦ Lacrimal, Frontal, Trochlear, Anterior ethmoidal, Posterior ethmoidal
- ✦ Veins
 - ✦ Superior ophthalmic, Inferior ophthalmic
- ✦ Lacrimal gland
- ✦ Lacrimal sac

CENTRAL SPACE



- ✦ Muscular cone /posterior/retrobulbar space
- ✦ Bounded anteriorly by the tenons capsule, peripherally by the EOM and their septa
- ✦ Posteriorly continues with the peripheral orbital space

CONTENTS



- ✦ Central orbital fat
- ✦ Nerves
 - ✦ Optic nerve (with its meninges)
 - ✦ Oculomotor
 - ✦ Superior and inferior divisions
 - ✦ Abducent
 - ✦ Nasociliary
 - ✦ Ciliary ganglion
- ✦ Vessels
 - ✦ Ophthalmic artery
 - ✦ Superior ophthalmic vein

Applied anatomy



- ✦ Retrobulbar block is given into this space
- ✦ Tumours arising give rise to axial proptosis
- ✦ Removed by lateral orbitotomy
- ✦ Optic n gliomas, meningiomas, cavernous hemangiomas, neurofibromas..

AGE CHANGES IN THE ORBIT



- ✦ Infantile orbits are more divergent ($\approx 115^\circ$) than those of adults ($\approx 40-45^\circ$)
- ✦ Interorbital distance is smaller in children- may give false impression of squint
- ✦ Periorbita much thicker and stronger at birth than in adults
- ✦ Roof much larger than floor in infancy
- ✦ Optic canal has no length at birth- *a foramen*
 - at 1 year of age ≈ 4 mm

SENILE CHANGES



- ✦ Largely due absorption of bone.
- ✦ Thus elderly skull holes sometimes occur in the roof of the orbit ,the periorbita being in direct contact with duramater.
- ✦ Walls show thinning and fissures are widened.

THANK YOU

