



Scleral Buckling

Anatomical & physiological considerations

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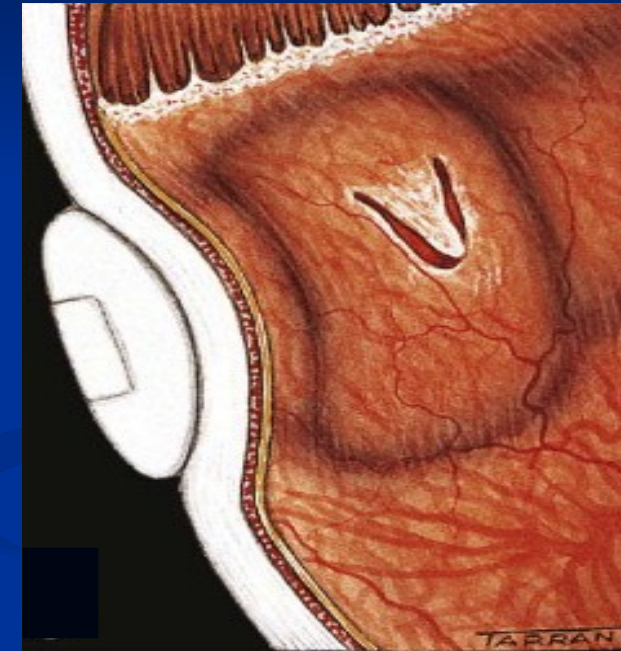
Cairo Egypt

**You are not a complete vitreo-
retinal surgeon unless you are a
good buckle surgeon**

**Vitreectomy is the last choice to
treat Rhegmatogenous RD**

The meaning of “Buckle”

- Scleral buckling means inward indentation of the sclera to nullify the traction forces of the vitreous.

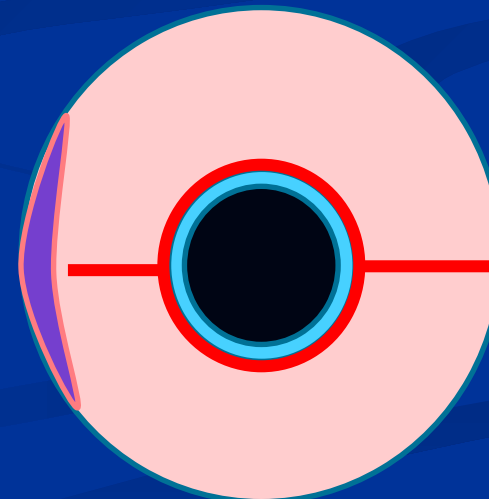
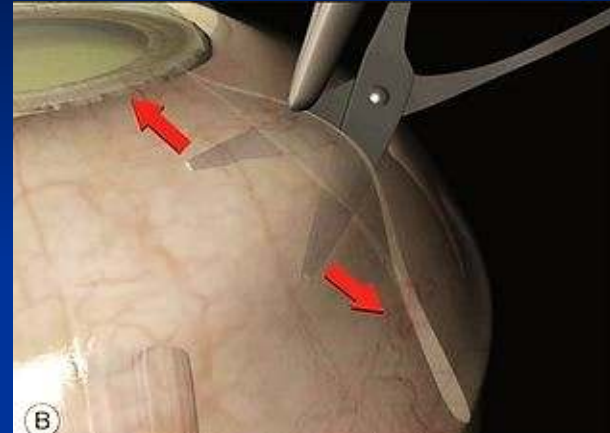


A lot of knowledge are needed

- The conjunctiva.
- The EOM & the spiral of Tillaux.
- The sclera.
- The choroid & Vortex Veins.
- The equator.
- The ora serrata.
- The vitreous.
- The canal of Pituit.
- Vitreous syneresis & PVD.
- Causes & types of retinal breaks.
- Forces bearing on retinal detachment.
- Modified Lincoff's rules.
- How does the buckle work?
- How does the encircling band work?

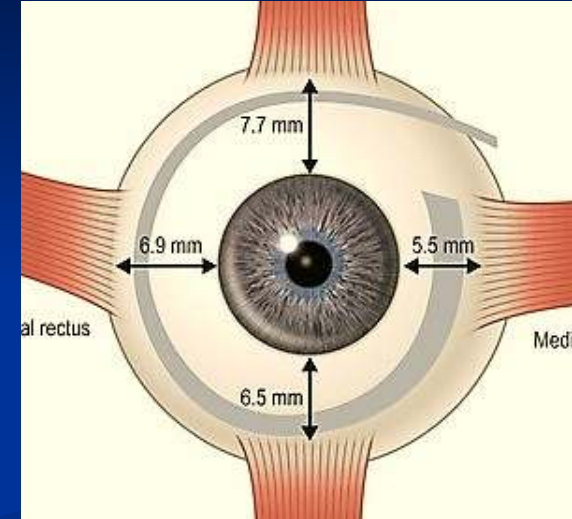
The conjunctiva

- Gentle handling and neat incisions.
- Start the incision 4 mm posterior to limbus (loose attachment to sclera).
- Dissect the conjunctiva and Tenon capsule as one layer.
- **Avoid extension of the nasal incision to the plica semilunaris → impossible to reconstruct the plica → chronic pain & disfigurement.**



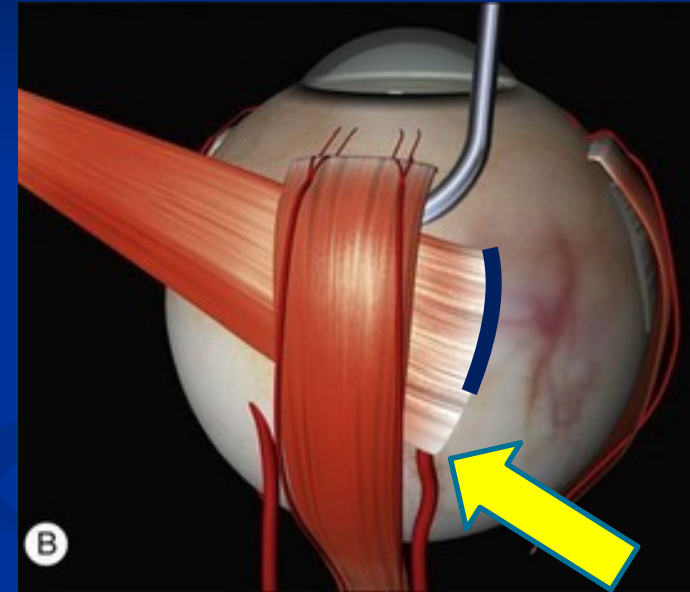
The EOM & the spiral of Tillaux

- The insertion of the 4 recti → the spiral of Tillaux.
- The spiral of Tillaux marks the ora serrata on the scleral surface.
- The equator is 5 mm posterior to the spiral of Tillaux.
- The vitreous base is 3-4 mm posterior to the spiral of Tillaux.
- Buckles should be at least 1mm posterior to the spiral of Tillaux to avoid rubbing with the muscle insertion & anterior ciliary vessels.



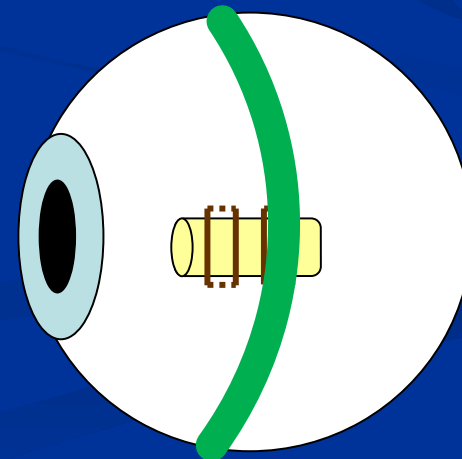
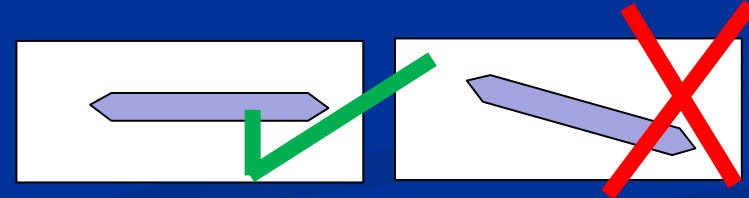
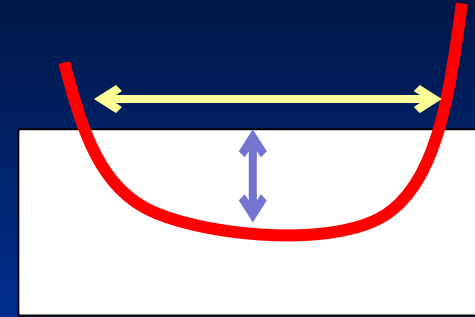
The relation between SR, SO & the upper temporal vortex vein

- The SO tendon is located under the surface of SR, 12 – 14 mm from the limbus, very close to the U T-V V.
- The SR is hooked from its lateral edge, not the medial edge.
- Do not swing the hook posteriorly in order to avoid inadvertent hooking of the SO or the VV.
- You can incise the lateral 1/3 of the SO insertion to facilitate buckle suturing if needed.



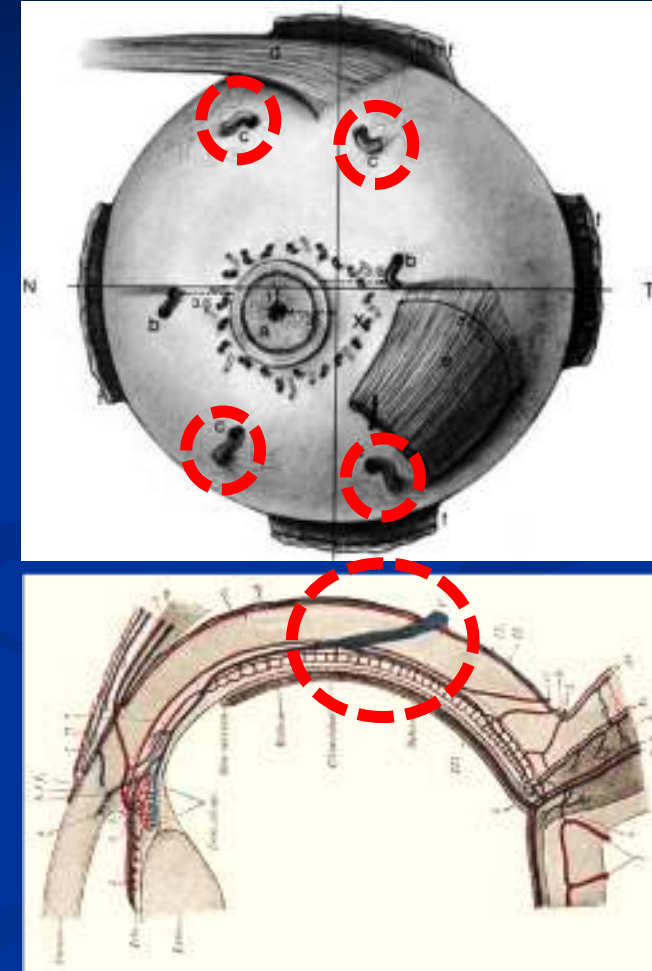
Suturing the buckle to the sclera

- Adequate suture length and depth (at least 50% of scleral thickness).
- Needle parallel to scleral surface.
- More than one mattress suture.
- Scleral indentation can be augmented by an overlying cerclage, segmental buckle or band.



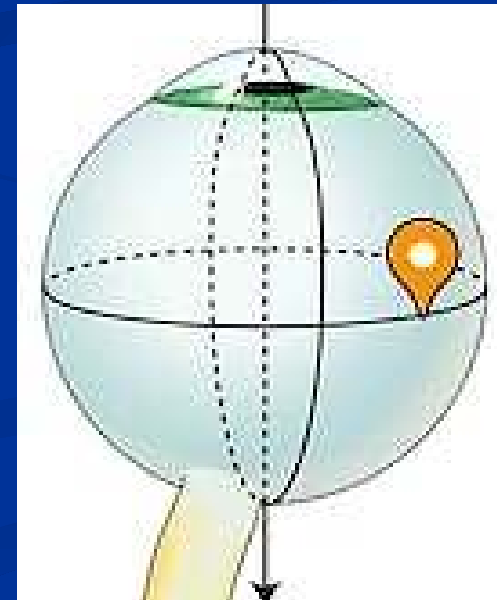
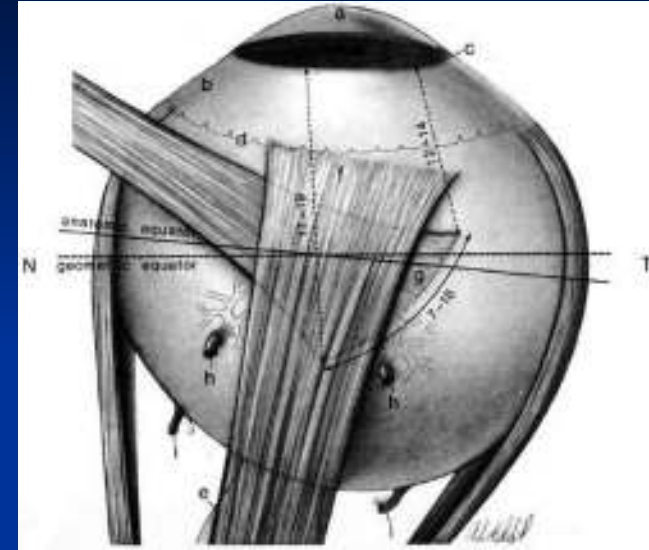
The choroid & Vortex Veins

- At least one in each quadrant.
- Intrasccleral course about 4 mm → avoid injury during suturing.
- Emerge 14 – 18 mm from limbus, close to the edges of the vertical recti → **drain close to the edges of horizontal recti.**
- Injury of VV, or compression by posterior cerclage → choroidal congestion, hemorrhage & effusion. Also → AS congestion and ischemia.



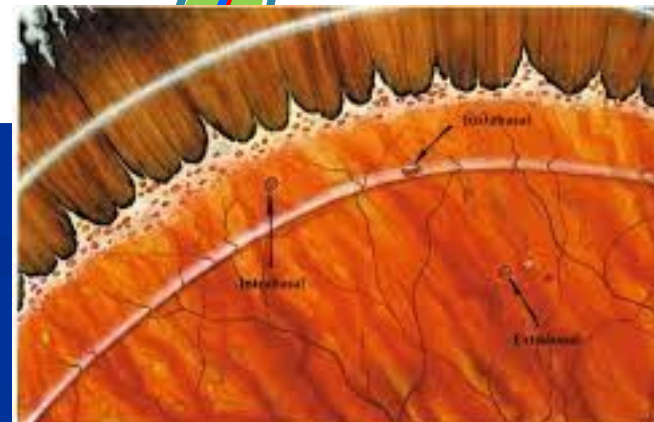
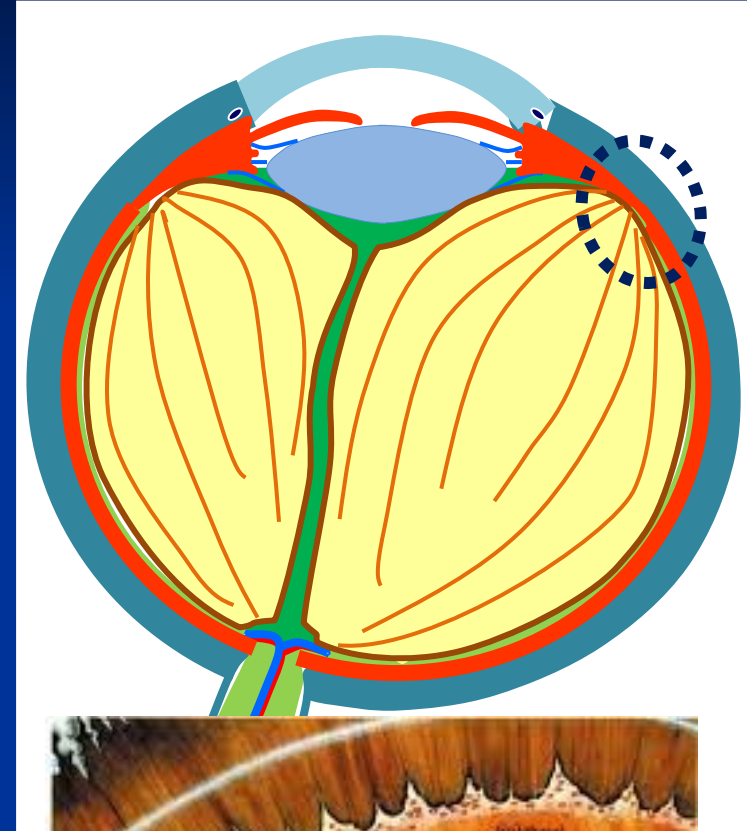
The equator

- It is the widest corneal diameter of the eyeball.
- **From outside:** it is about 5 mm from the spiral of Tillaux.
- **From inside:** it is nearly 4 disc diameters from the ora serrata.
- VV emerge few millimeters posterior to the equator.
- Scleral thickness at the equator is about 1 mm.



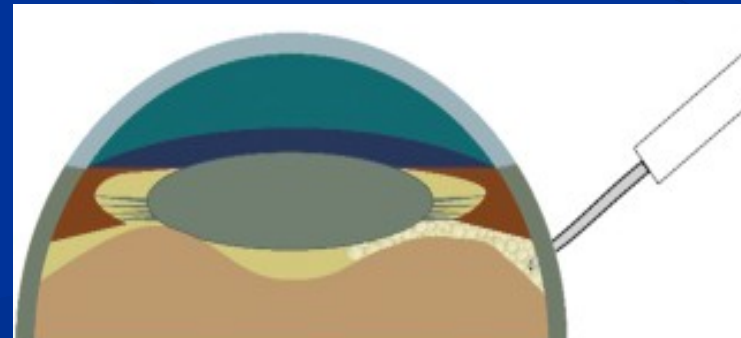
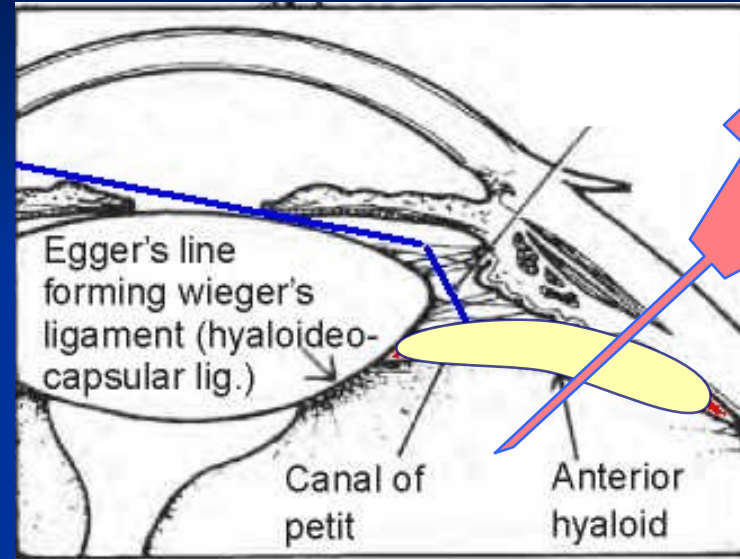
Anatomy of the vitreous

- The vitreous base.
- Posterior hyaloid face.
- Anterior hyaloid face
- Canal of Pituit.
- Cloque canal.
- Burger's space.



The canal of Petit

- It is the space between the anterior hyaloid face posteriorly & the pars plana and zonule anteriorly.
- Injection of air or gas in this space → ineffective tamponade → the “**donut sign**” or “**sausage sing**”.



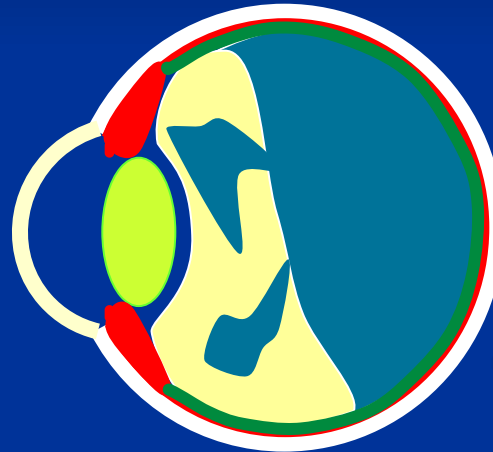
Pathology of vitreous Syneresis, PVD & Retinal tears

Syneresis



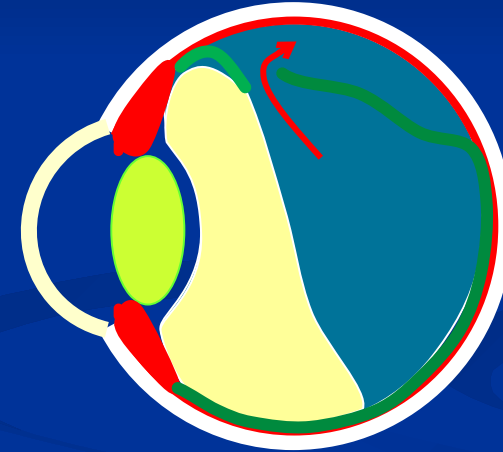
Lacunae of fluid within the gel due to collapse of fibrillar network of vitreous

PVD



Escape of fluid from the lacunae to the sub-hyaloid space

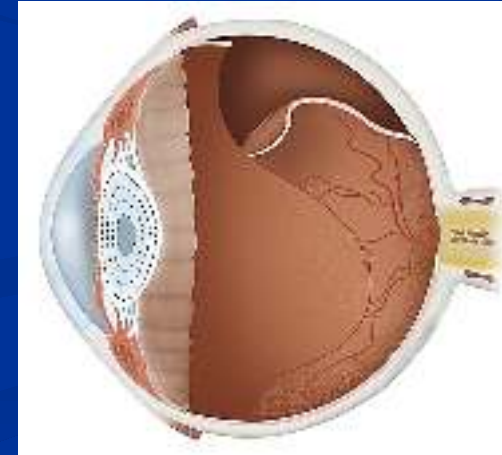
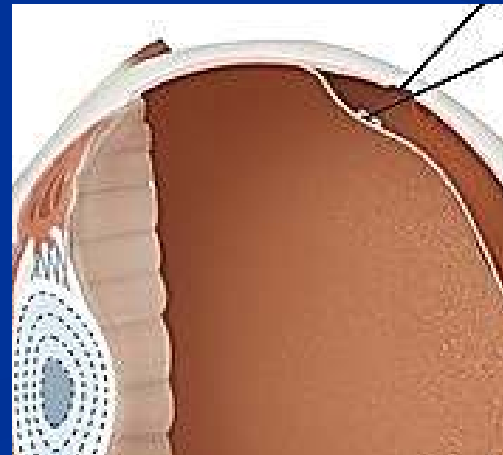
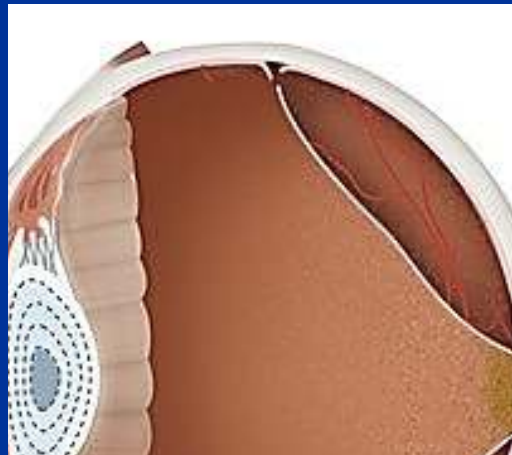
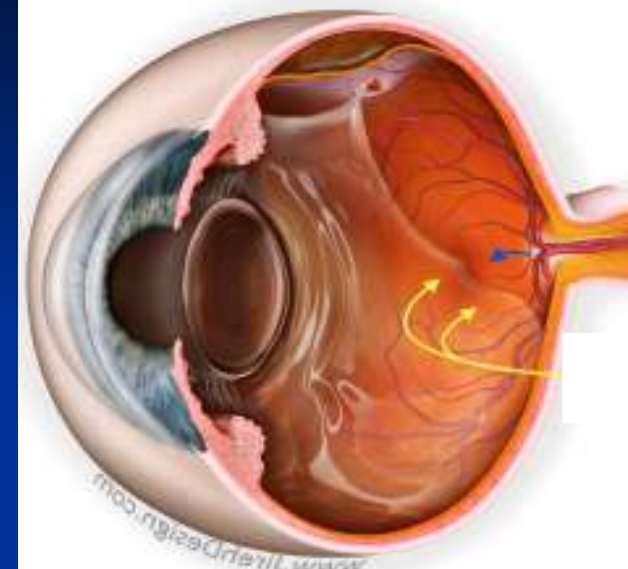
Retinal tear & detachment



Vitreous traction at points of abnormal strong attachment to the retina → Retinal tear

Complications of complete PVD

- Vitreous hge or disc hge.
- Retinal breaks:
 - Flap tear.
 - Operculated break.
 - Spontaneous giant break in high myopia.



Causes & types of retinal breaks

A. Associated with PVD

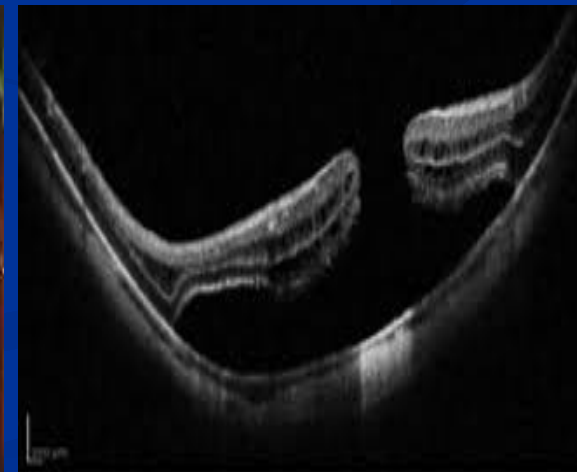
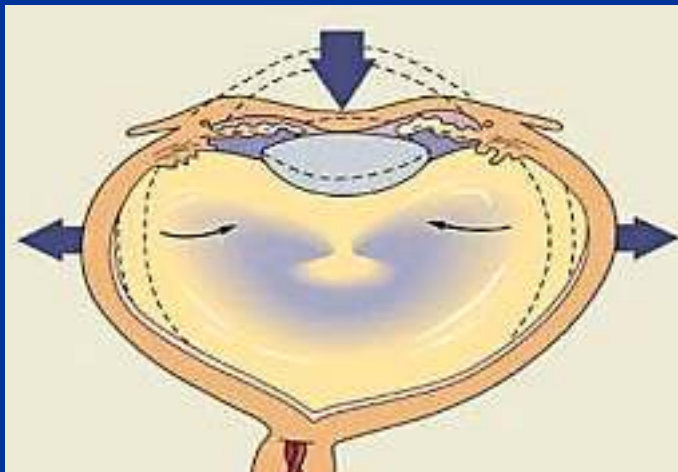
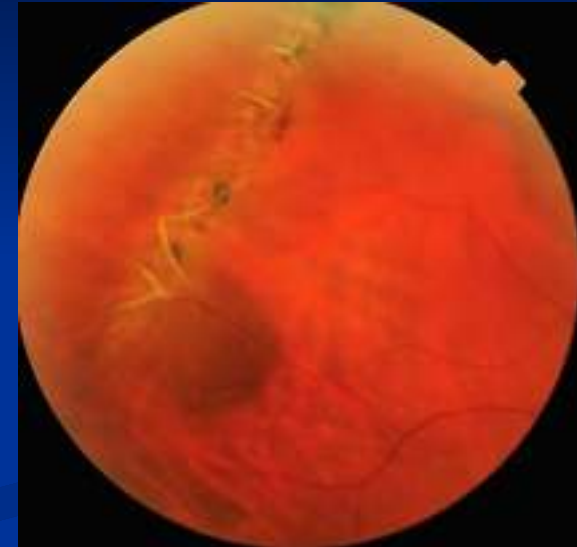
- Flap tear.
- Operculated break.
- Spontaneous giant break in high myopes.



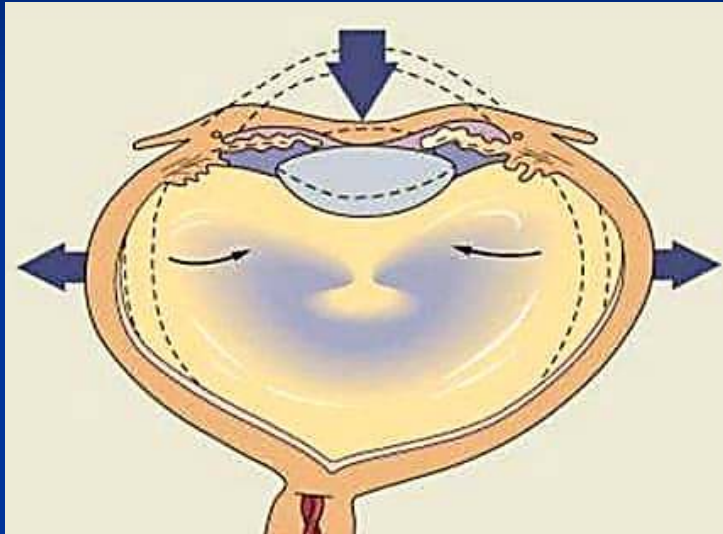
Causes & types of retinal breaks

B. Not associated with PVD

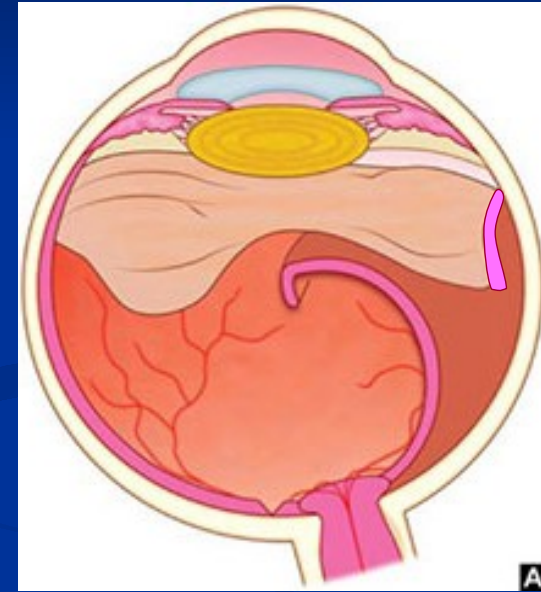
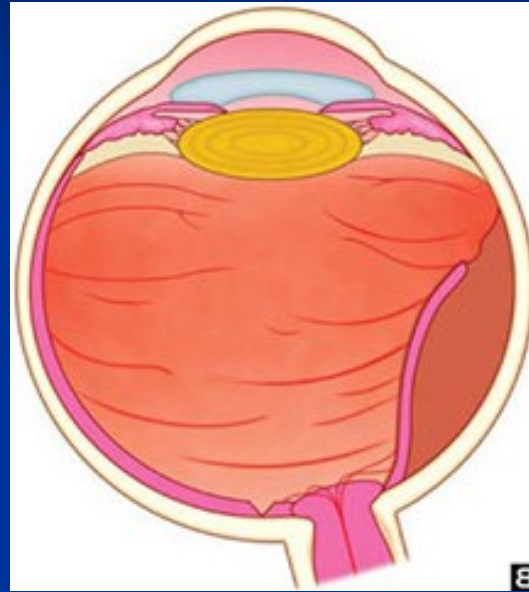
- Atrophic retinal holes +/- lattice degeneration.
- Macular holes.
- Traumatic retinal giant breaks & dialysis.



Difference between idiopathic & traumatic giant breaks



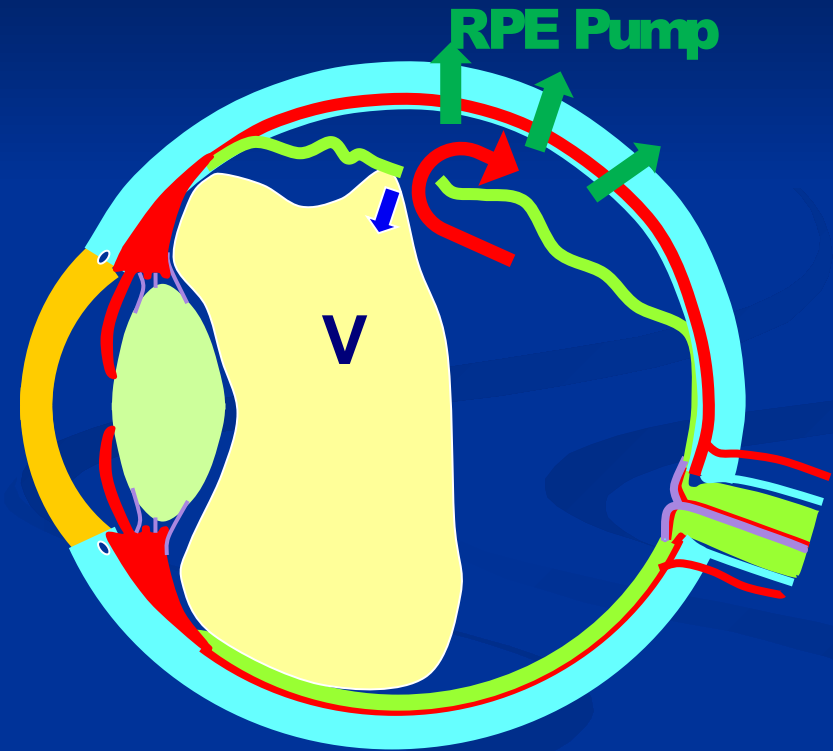
Traumatic giant break



**Spontaneous
giant break
(high myopia)**

Forces Bearing on Retinal Detachment

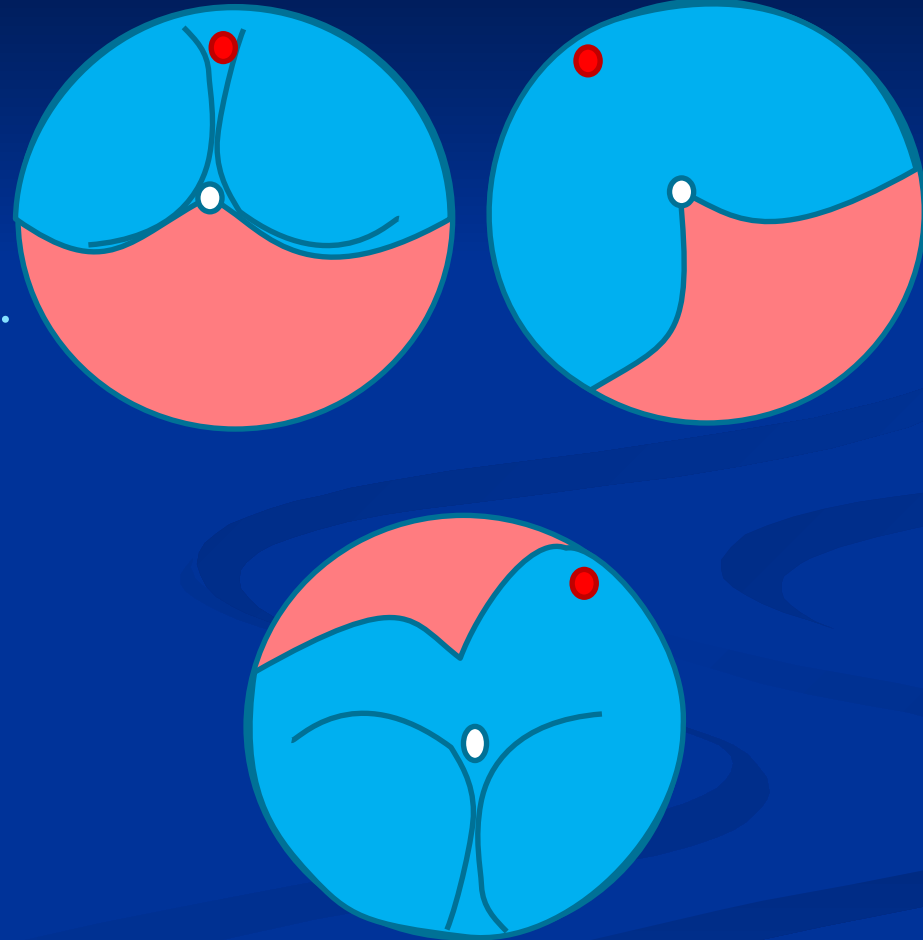
- Vitreous traction force (V) exceeds the biological RPE pump $\rightarrow$ the edge of the break will be elevated allowing liquified vitreous to pass behind the retina $\rightarrow$ RD.
 - Traction is a major precipitating factor for RD. It should be relieved for treatment.
 - Operculated breaks are safer.
 - Smaller & inferior breaks are safer.
 - Myopes have weaker RPE pump.



Modified Lincoff's rules

Upper breaks tend to cause bullous RD

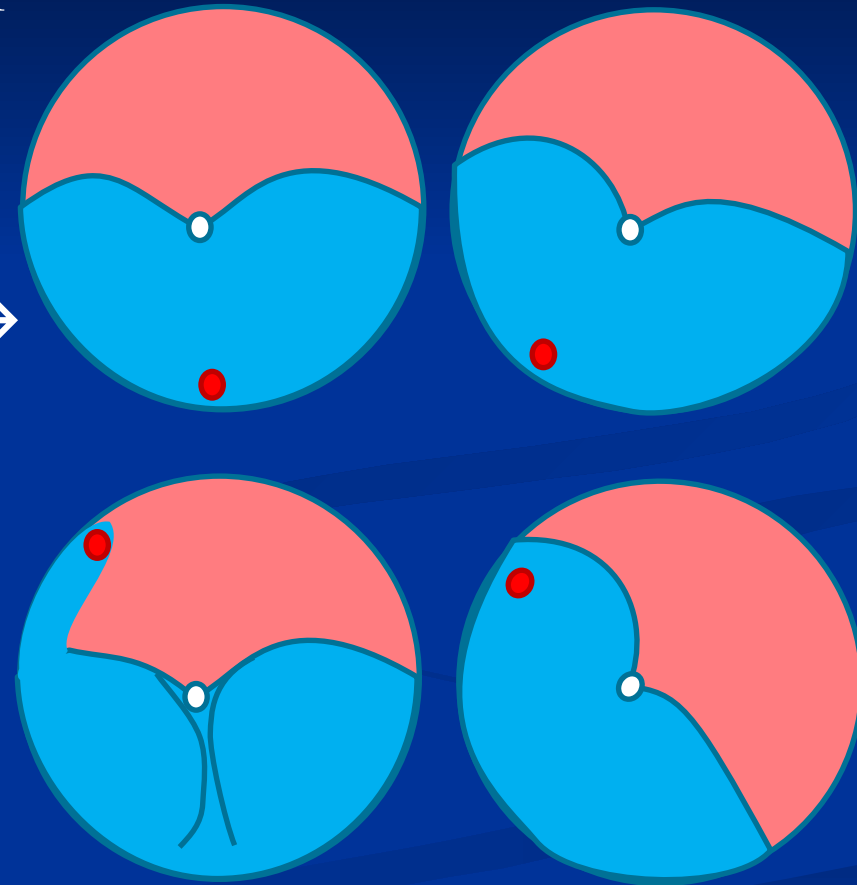
- A superior RD crossing the middle line, symmetrical levels on both sides of the disc, with inferior attached retina →
 - Break close to the 12 o'clock.
- As above, but one side is detached more →
 - Superior break on the side of lower RD border.
- A subtotal RD with a superior wedge of the attached retina →
 - the break will locate in the periphery near its highest border.



Modified Lincoff's rules (cont.)

Lower breaks tend to cause shallow RD

- Inferior shallow RD with equal SRF levels on both sides of the OD →
 - Break at 6 o'clock position.
- A shallow inferior RD in which the SRF is slightly higher to one side →
 - Inferior break to the higher side.
- A bullous inferior RD →
 - Break above the horizontal meridian.
- Lateral RD →
 - The break will be within 1.5 clock hours of the higher border of RRD.



How does the buckle work?

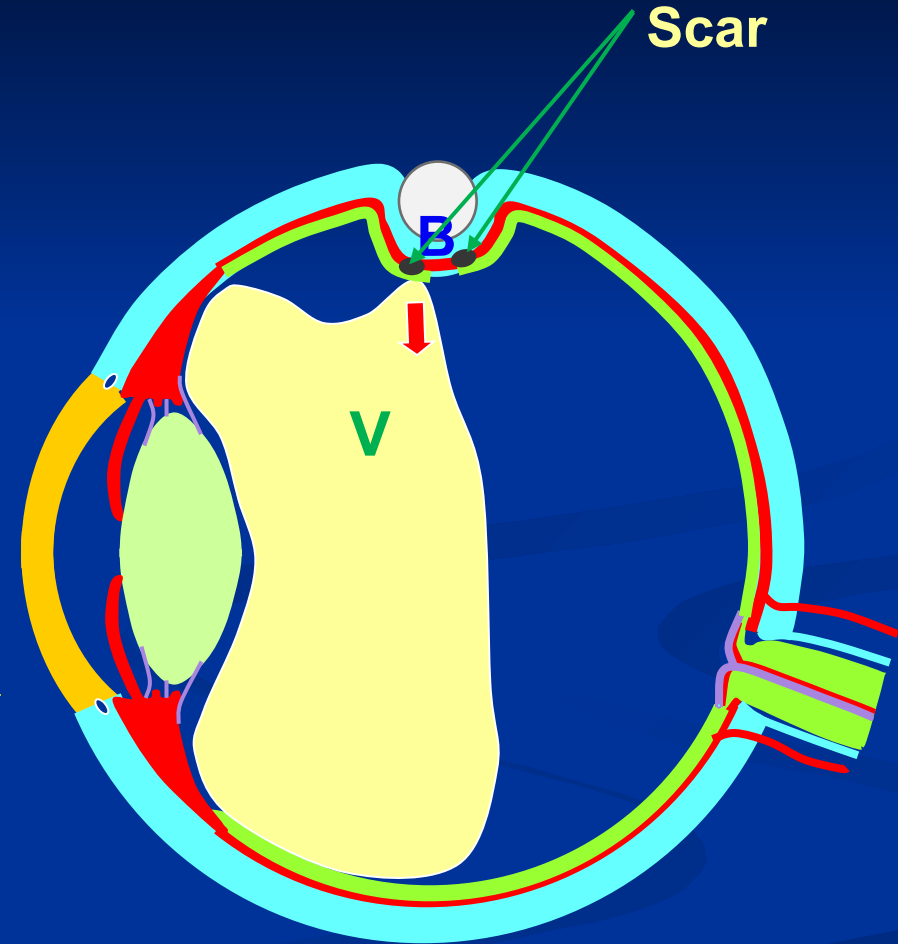
- The scleral buckle (B) counteracts the vitreo-retinal traction forces (V).
- The scar strength (S) induced by cryo (or laser) around the retinal break.

$$\mathbf{B + S + RPE Pump \geq V}$$

B = Buckling indentation force

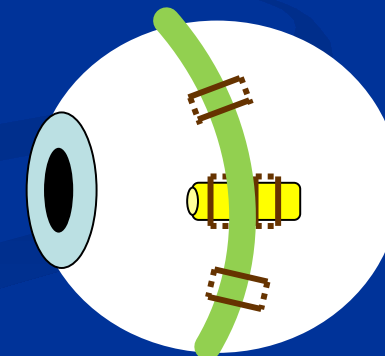
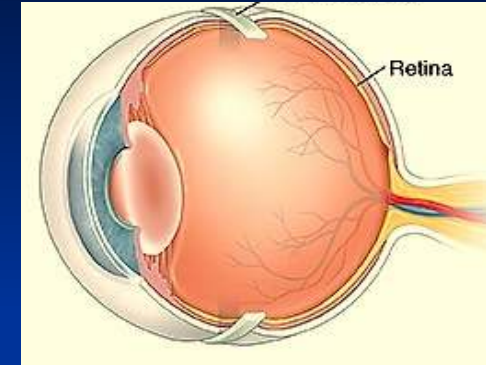
S = Strength of scar

V = Vitreous forces



How does the encircling band work?

1. Reduces the circumference of the equator of the eye (0.5 mm reduction of the diameter of the eyeball $\rightarrow$ 3.14 mm reduction in the circumference) ($C=2R\pi$).
2. Prevents equatorial expansion during eye rubbing and trauma.
3. Augments & maintains radial buckles.
4. Over tightening $\rightarrow$ scleral indentation (buckling).





Thank You