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RETINAL DETACHMENT (Rhegmatogenous)

Dr. H. S. Ray (M.S., Ophthalmology, FRF)- Drishti Eye Hospital, Madan Mahal main road, Jabalpur-2
Session dated: 20-02-2005, Hotel Krishna. Dinner meeting sponsored by Ajanta Pharma.

Important Features of Retina

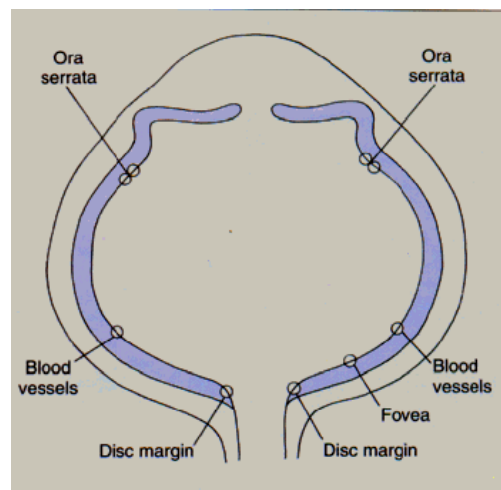
- o Translucent Structure - 0.5mm / 0.2mm / 0.1mm
- o Sensory Retina a continuous sheet of tissue
- o Extends from Optic Nerve to Ora Serrata.
- o Firmly Attached at Ora Serrata & Optic Nerve
- o Retina is derived from inner layer of embryonic optic cup.
- o RPE from outer layer of the cup.
- o No junction system between Retina & RPE

Forces of Retinal Adhesion

- o Viscoelastic tamponade of Vitreous Gel.
- o Hydrostatic Intraocular Pressure.
- o Transretinal Fluid Gradient
- o Interphotoreceptor Matrix (RPE). Acts as Glue
- o Suction forces of RPE Pump. Bd Retinal Barrier
- o Choroidal Concentration gradients:
 - (a) Ionic Forces
 - (b) Osmotic Forces
 - (c) Oncotic Forces

Normal Adhesion Forces

Areas of Adhesion of Vitreous & Retina

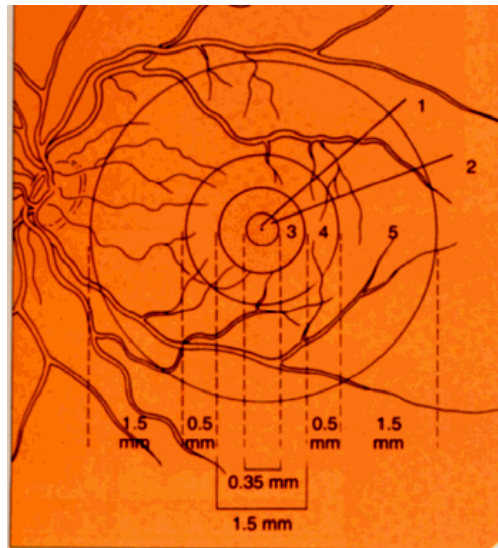


Surgical Anatomy of Macula

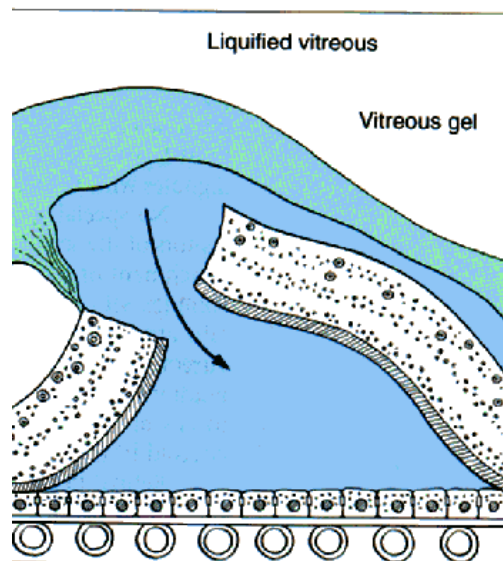
- o 5.5mm in Diameter & Within Temporal Arcades
- o Double Layered ganglion cells

o Consists of :

1. **Umbo**- Basal Lamina, Muller Cells, Cones, 0.13mm
2. **Foveola**- 0.35mm, Cones & Muller Cells, 0.55mm
3. **Fovea**- 0.5mm, Capillary & Rod Free,
4. **Parafovea**- 0.5mm around Fovea, 10 layers of Retina, 4- 6 layers of Ganglion cells, 7-11 layers of Bipolar Cells
5. **Perifovea**- 1.5mm belt around Parafovea,
6. **Peripheral Retina**- 1.5mm at near periphery, 3mm at Mid periphery, 10-16mm at Far periphery



Schematic of Retinal Tear with RD -



Clinical Types of RD

- o Rhegmatogenous - Retinal Tear
- o Nonrhegmatogenous - No Tear Exudative & Tractional

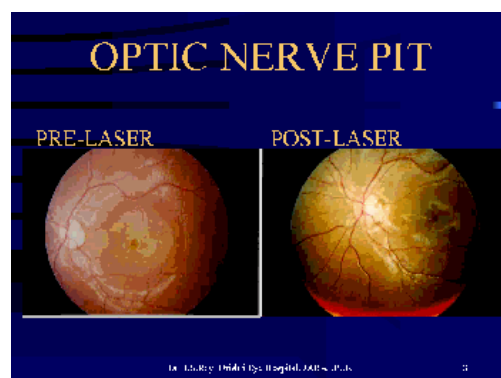
Causes of Rhegmatogenous RD

- o Peripheral Retinal Lesions
- o PVD - Age, Yag, Vit-He, Inflammation, DM
- o Myopia
- o Ocular Sx- Cataract, TPPV, PKP, Ant Vit
- o Scleral Perforation
- o Trauma
- o Ocular Inflammation / Infection- CMV retinitis, ARN, Pars Planitis, Toxocara, Toxoplasma
- o Coloboma of Choroid & Retina
- o Retinoschisis- Senile & X-Linked Juvenile
- o Marfan's Syndrome, Wagner-Jansen-Stickler's Synd., Goldman- Favre, Homosystineuria, Ehlers-Danlos Synd.

Causes of Tractional RD

- o PDR
 - o Sickle- Cell Retinopathy
 - o ROP
 - o Familial Exudative Vitreoretinopathy
- Causes of Exudative RD
- o Choroidal Tumours
 - o Harada's Disease
 - o Posterior Scleritis
 - o Idiopathic Central Serous Chorioretinopathy
 - o Idiopathic Uveal Effusion Synd.
 - o Nanophthalmos
 - o Malignant Hypertension
 - o Toxemia of Pregnancy
 - o Collagen Vascular Disease
 - o Retinal Telangiectasia
 - o DIC, Optic Nerve Pit, Morning Glory Synd

OPTIC NERVE PIT - Pre-LASER/Post-LASER



Rhegmatogenous RD

- o Physical Rupture of Retinal Tissue -Break
- o Access of fluid into the Subretinal Potential Space
- o In Majority of RRD a Break is seen with IO
- o In others a Small Atrophic Hole -3 Mirror
- o In small percentage No Breaks can be found "Un-Holy RD"

Symptoms of RD

- o Flashes of light "Photopsiae"
- o Floaters "Tobacco Dust"
- o Shimmering Vision - wavy or watery quality
- o Obscuration of Visual Field- "Dark Shadow"
- o Blurring of Central Vision
- o Sudden Loss of Vision- Vit. Haemorrhage

Signs Of RD

- o Bullous Contour
- o Tortuous Vessels
- o Corrugation of Retinal Surface
- o Undulating movement, Ripples Like a Parachute
- o Retinal Breaks
- o High Risk Characteristics:
 - Anterior Vitreous Pigment Granules -14% Tear
 - Vitreous Cells, Preretinal or Vit Haemorrhage

Types of Retinal Breaks

- o Horse Shoe Tear (Flap Tear) (aka HST)
- o Arrow Head Tear

o Arrow head tear

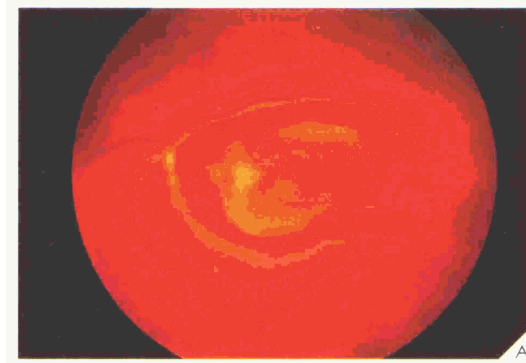
o Operculated Tear- Strong Vit Traction

o Giant Retinal tears- 90 Degree or more

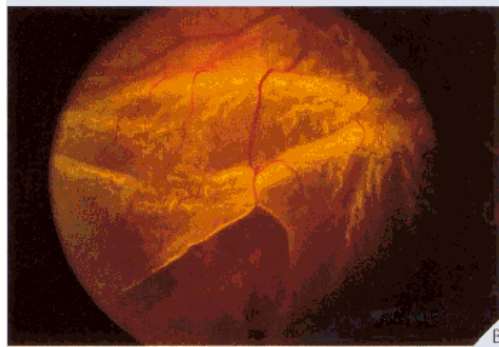
o Retinal Dialysis - Posterior Edge is Attached to the Vit Base,- No Curling

o Atrophic Holes- No Vit Traction

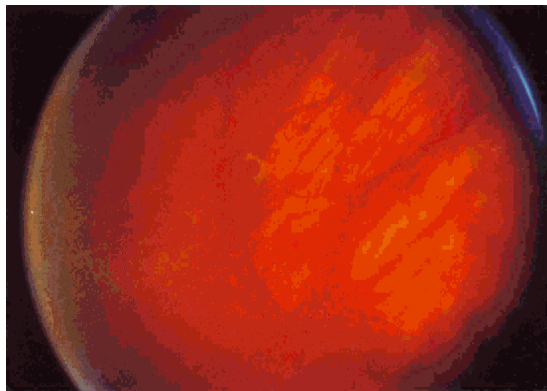
HST



HST with RD



ATROPHIC HOLE

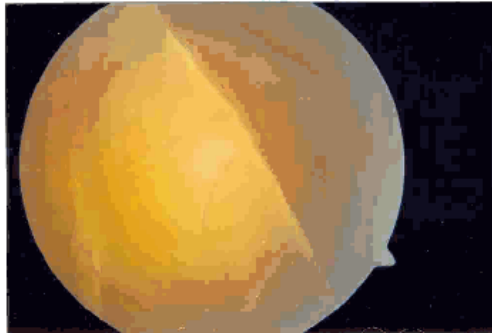


DOUBLE HST

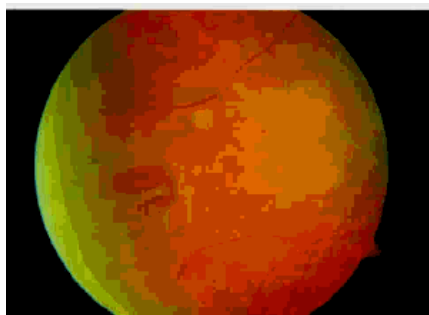




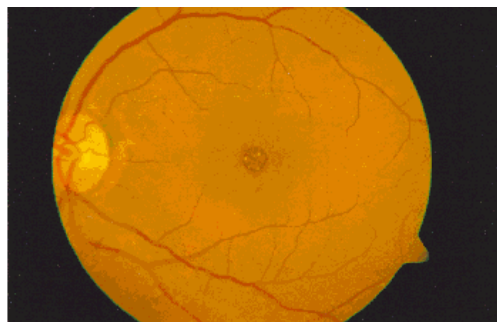
GIANT RETINAL TEAR



HST

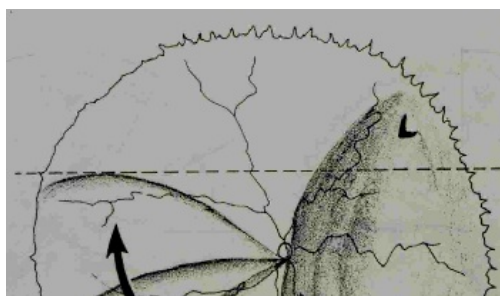


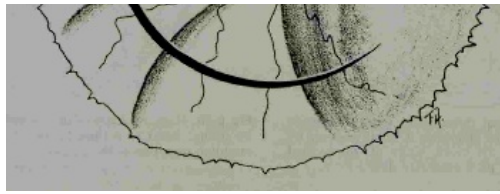
MACULAR HOLE



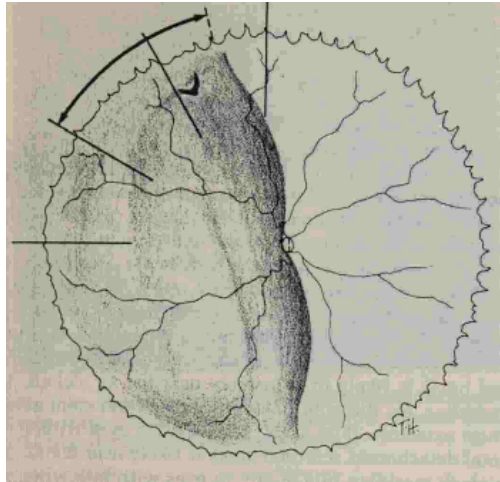
Lincoff's & Giesser's Rule

RD in Both Quad. On same side

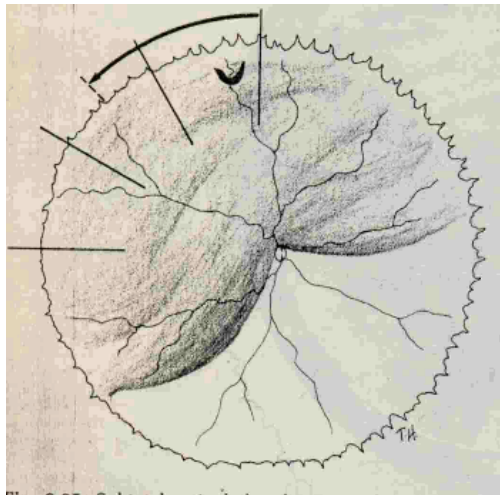




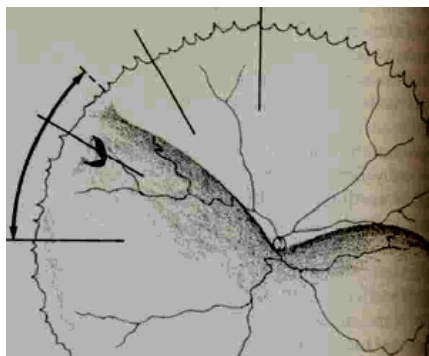
Sub-Total RD- Both Upper Quad.



RD One Upper & Both Lower Quad

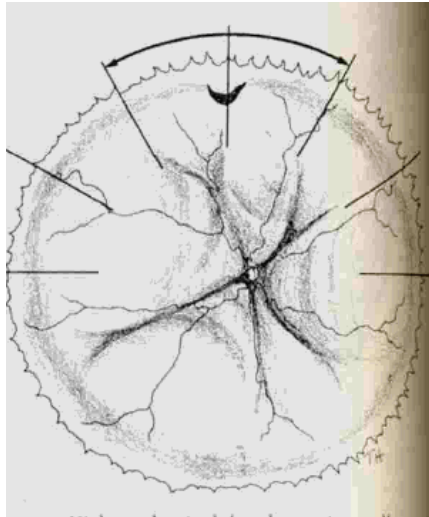


High Total Bullous RD

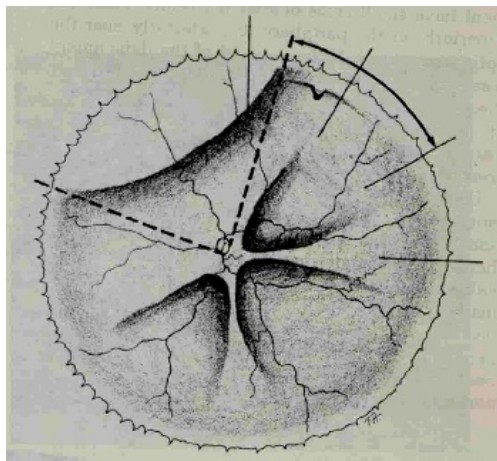




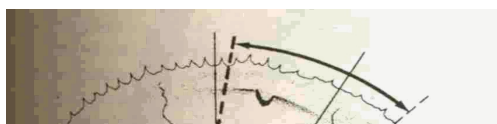
Near Total RD

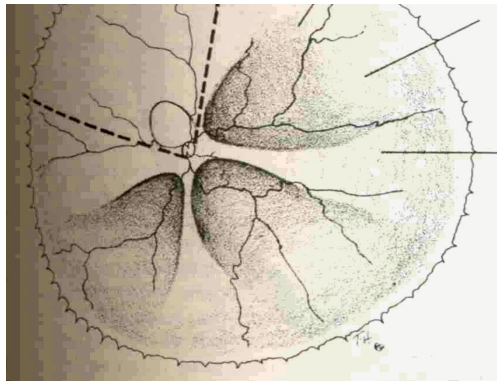


RD with Posterior attached Retina

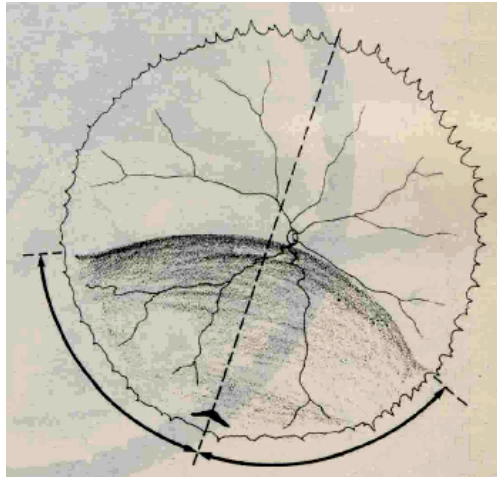


Superior Bullous RD

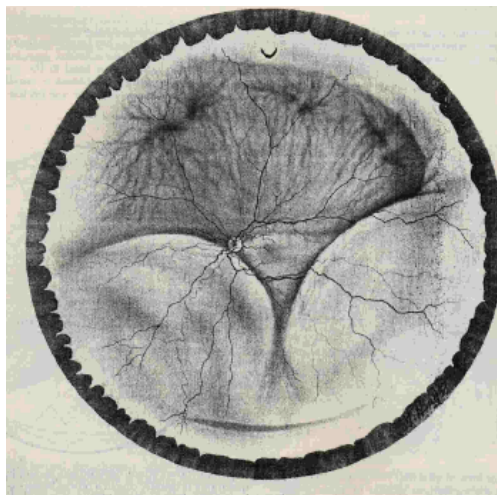




Inferior Low RD - Bisecting Line

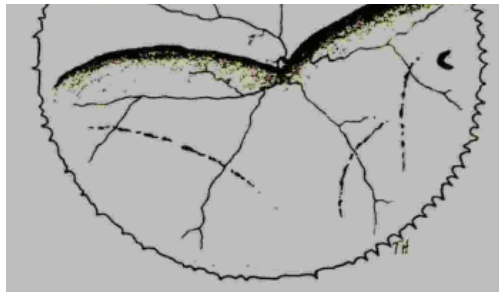


Highly Elevated Inferior RD- Gutter



Longstanding RD with Demarcation Lines





Peripheral Conditions Associated with Retinal Tears

- o Lattice Degeneration
- o Vitreoretinal Tufts
- o Meridional Folds

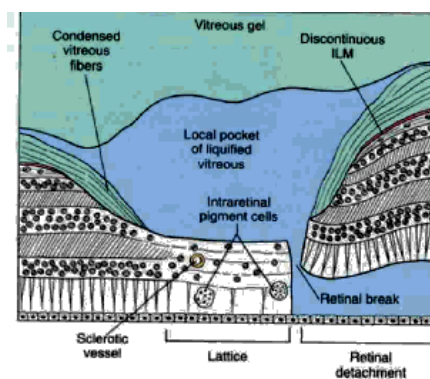
1. Lattice Degeneration

- o An Area with Absence of ILM
- o Overlying Area of Liquefied Vitreous
- o Condensation & Adherence of Vit Gel
- o Inner Retinal Layer Atrophy
- o Incidence- 8% to 10%
- o In RRD Lattice account for 20%
- o In 30% to 40% RD caused by LD- Atrophic Holes
- o Majority of RD by LD are caused by Tear at Posterior Edge of LD
- o Retinal Tears form after PVD
- o Radial or Perivascular LD - Severe type of RD
- o Sticklers Syndrome - 47% Bilateral RD

Pathogenesis of Lattice Degeneration

- o Localized Vitreous Traction
- o Primary Retinal Vasculopathy
- o Localized Anomaly of ILM

Schematic of Lattice Degeneration



Management of Lattice Degeneration

- o Lattice without Retinal Breaks - No Rx
- o Lattice with Atrophic Holes - No Rx
- o Lattice + Holes+ Sub clinical RD - Treat
- o Lattice+ Traction Tear -
Treat : If Fellow eye has RD
Strong Family History of RD
Aphakic Eyes
- o Asymptomatic Traction Tear - No Rx
- o Acute Symptomatic Tears - Treat in Phakics & Aphakics

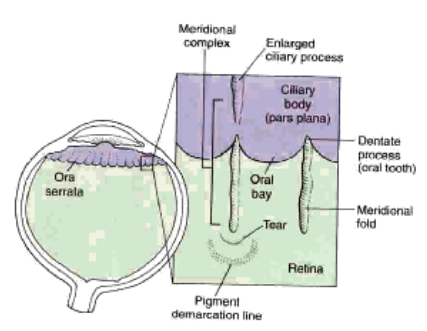
2. Vitreoretinal Tufts

- o Small Peripheral Retinal Elevation
- o Focal Vitreous Traction
- o RPE Hyperplasia surrounding the Tufts
- o Excessive VR Traction - Retinal Tears
- o Small Clumps of Peripheral Pigments may provide a clue to identify Retinal Tears

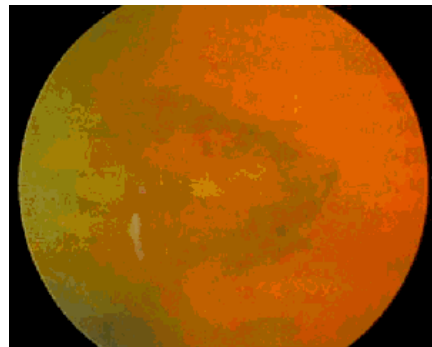
3. Meridional Folds

- o Congenital Pleat of Retinal Tissue underlying Vitreous Base
- o Usually Located Supranasally
- o Associated with Dentate Process of Ora Serrata, may extend posteriorly between Oral Bays
- o With enlarged Ciliary Process Meridional Complex
- o Retinal Tears seen in the thin retina at the Posterior Limit of these Folds

Meridional Folds Image 1



Meridional Folds Image 2



Peripheral Conditions Not Associated with RD

- o Typical Microcystoid Degeneration
- o Reticular Microcystoid Degeneration
- o Cobblestone Degeneration
- o RPE Hyperplasia

- o Congenital Hypertrophy of RPE
- "Bear Tracks"

1. Microcystoid Degeneration

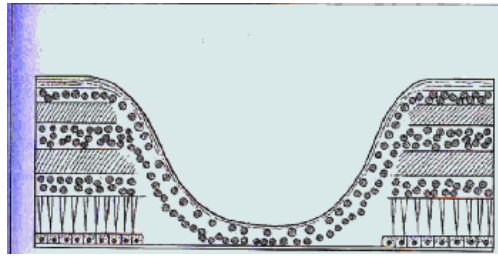
- o Progressive cavitation of outer Plexiform & Inner Nuclear Layers
- o Reticular Microcystoid Degeneration -18%
- o May lead to Retinoschisis
- o Have negligible clinical significance
- o Typical & Reticular Microcystoid Degen. are precursors of Typical & Reticular Retinoschisis

2. Cobblestone Degeneration

- (Paving stone)
- o Atrophy or Absence of Outer Layers of Retina
- o Loss of RPE
- o Absence of Choriocapillaries
- o Lesions occur as Single or Confluent areas
- o Not related to Primary RD
- o Sometimes Retina Tears occurs along the Posterior Edge of Cobblestone Degeneration

o Sometimes Retinal Tears occur along the Posterior Edge of Cobblestone Degeneration

Cobblestone Degeneration Image



3. RPE Hyperplasia

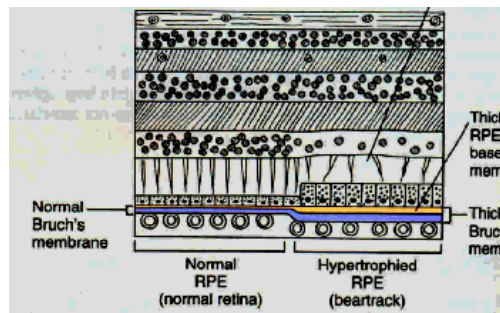
- o Posterior to the Ora Serrata along the Vitreous Base
- o Not associated with RD
- o Should not be confused with Lattice Deg.

4. Congenital Hypertrophy of RPE

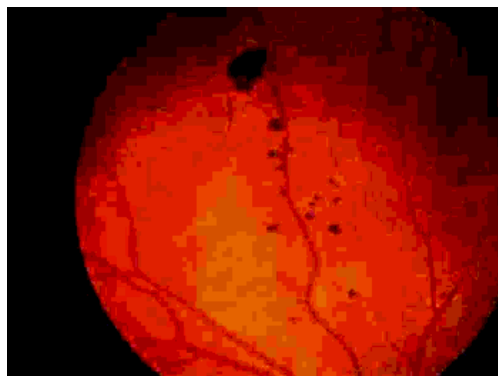
- o Large, Well Demarcated, Usually Black area
- o May contain Round Lacunae of normal Retinal colour
- o Often surrounded by a Halo
- o As a Wedge-shaped area of small pigmentation
- o Apex pointing to the Optic Nerve- Bear Tracks
- o Histologically: Enlarged RPE cells, with Large Spherical Melanin Granules, or Macromelanosomes
- o No Retinal Breaks
- o If seen Bilaterally - Rule out Gardner's Syndrome

Carcinoma COLON

Congenital Hypertrophy of RPE Image



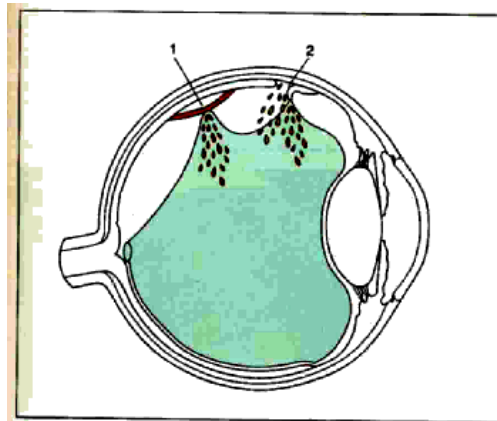
Bear Tracks Image



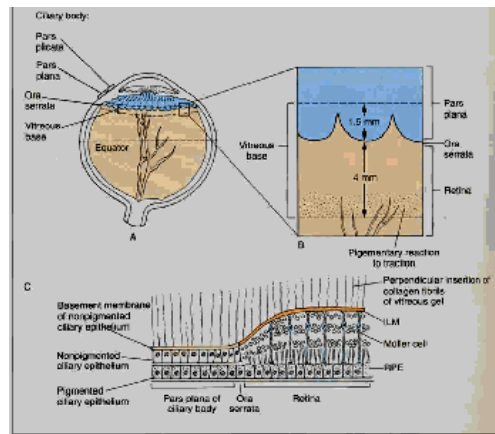
Vitreous Conditions / PVD

- o Posterior Vitreous body separates from Retina
- o Collapse of Vitreous Gel anteriorly towards Vitreous Base "Syneresis"--- "Vitreoschisis"
- o Collagen Fibres in Vitreous Base are firmly attached to Basement Membrane of Retina & Pars Plana Epithelium
- o Retinal Breaks seen at Posterior to Vit. Base
- o 2mm to 3mm posterior to Ora - 360 degrees
- o Vitreous attached to Anterior Edge of Tear / Flap

PVD Image



PVD & Mechanics of Retinal Breaks Image



PVD

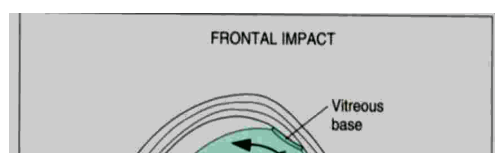
- o Spontaneous event
- o Incidence increases with Age / Large Axial Length
- o 27% bet 60-69yrs
- o 63% above 70yrs
- o Higher in Aphakics & Myopes
- o Symptoms of Flashes of Light / Floaters
- o Floaters- Weiss Ring, RBC & Cells from Optic Disc, Aggregation of Collagen Fibers

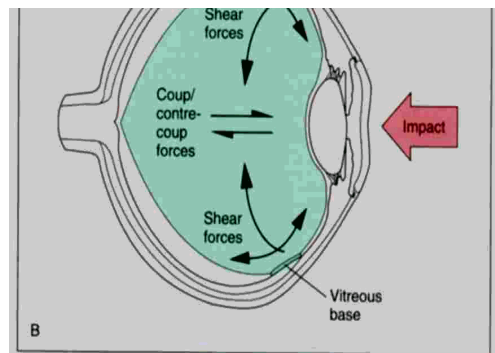
Incidence of Retinal Tears with PVD

- o 10% to 15% with symptoms of PVD have Retinal Tears
- o With Vitreous Haemorrhage incidence is 70%
- o Without Haemorrhage - only 2% to 4%

Traumatic Retinal Breaks

- o Blunt Trauma
 - o Anteroposterior Compresses the Globe
 - o Retinal Breaks- Infratemporally & Supranasally
 - o Avulsion of Vitreous Base with no Retinal Tear
 - o Acute Retinal Breaks with Vit Hem. & PVD - More dangerous
- Mechanism of Trauma Image





Treatment of Retinal Breaks

- o Aim - Chorioretinal Scar at Posterior & Anterior Edges
- o Symptomatic HST -Treat
- o Cryopexy & Laser Retinopexy
- o Lattice without symptoms- Don't Treat
- o Treat
- o Symptomatic Lattice with Breaks
- o Lattice with Retinal Breaks in other part
- o Lattice with High Myopia & RD in fellow eye

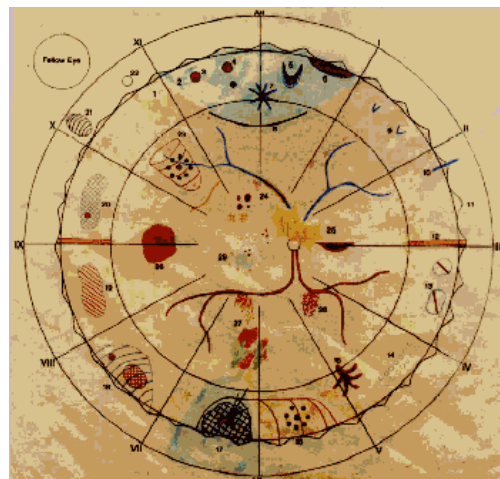
Treatment of RRD

- o Aim- Anatomically repose the sensory Retina to the RPE Chorioretinal Scar
- o Retinal Break- Cryo / Laser
- o SRFD
- o Retinal Break supported & closed (Externally / Internally)
- o Scleral Buckling - Silicon Tyre / Band / Sponge / Fascia Lata / Temporary Balloon
- o Pneumatic Retinopexy- Air / SF6 / C3F8 / C2F6
- "Positioning of patient"
- o TPPV- Gas / Silicon Oil Tamponade

Examination of Retina

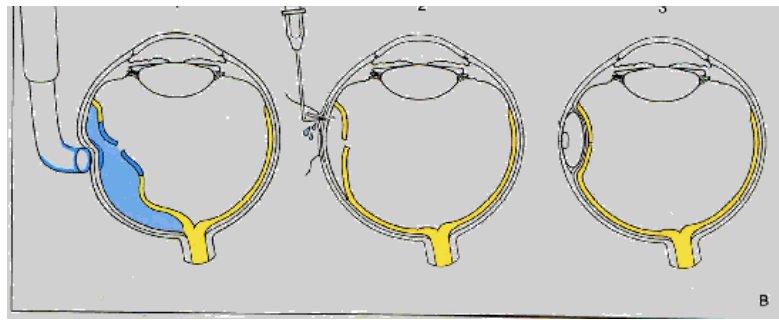
- o Indirect Ophthalmoscope
- o Goldman,s Three Mirror Lens
- o 90 D Lens
- o Mainster's Quadriscopic Lens
- o Rodenstock Panfundoscopic Lens
- o USG
- o OCT
- o UBM

Retinal Diagram Image



Basics of RD Surgery (1/Cryo, 2/SRDF, 3/Buckling)





Complications of RD Surgery

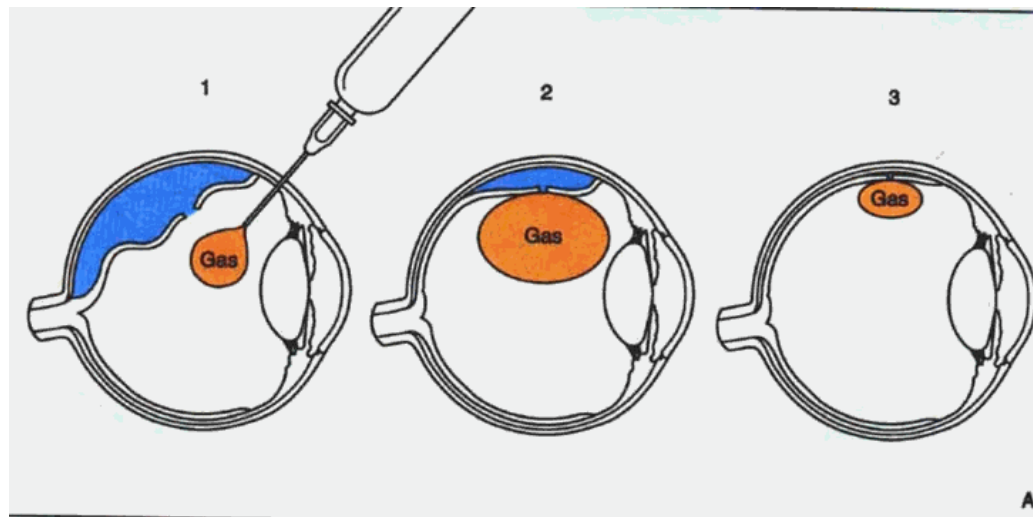
- o Corneal
- o Conjunctival / Tenons capsule
- o Squint
- o Scleral- Perforation , Intrusion of Buckle
- o Compression of Vortex Veins - Effusion
- o Anterior Segment Ischaemia
- o Raised IOP - Retinal Ischaemia
- o PVR & Redetachment
- o Cataract - Gas, Silicon Oil
- o Emphatic Buckle
- o Infection - Buckle or Endophthalmitis

Pneumatic Retinopexy

CRYO / LASER SRFD?? AIR+GAS SF6 / C3F8/C2F6

Indications of Pneumo-Retinopexy

- o Isolated superior Break less than 1 Clock Hrs.
- o Multiple sup. Breaks within 1 Clock Hrs
- o Macular Breaks or Posterior Breaks
- o Redetachment after RD Sx due to Superior Break
- o Fishmouthing of HST after RD Sx



Contraindication of PR

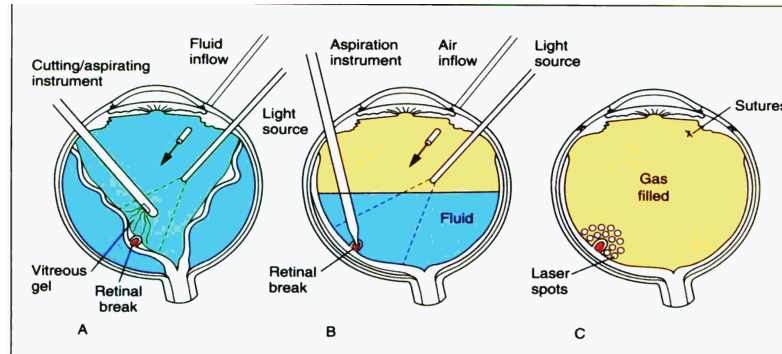
- o Multiple Breaks over more than 1 Clock Hrs.
- o Single Large Break > 1 Clock Hrs.
- o Breaks in Inferior 4 Clock Hrs.
- o PVR of Grade C or more
- o Uncontrolled Glaucoma
- o Hazy media & Poor preoperative Assessment
- o Physical Disability

Complications of PR

- o New or Missed Breaks, Reopening of Breaks
- o PVR changes
- o Redetachment
- o Persistent SRF
- o Macular Pucker

- o ERM formation
- o Vitreous Haze
- o Sub-Retinal gas, Sub-Retinal Pigment Migration
- o Raised IOP
- o Lens Opacities, Dislocation of IOL
- o Bullous Keratopathy

VR surgery (TPPV)



PVR

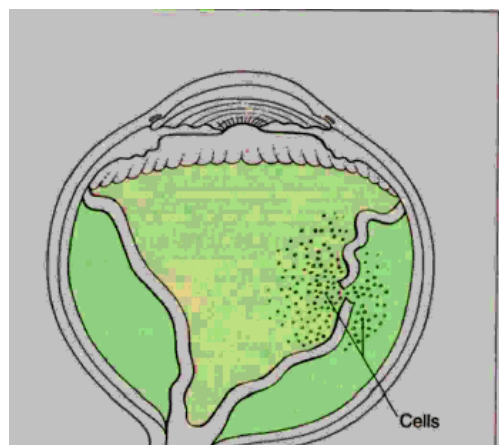
- o Ugly Complication of Retinal Sx & Large HST
- o RPE, Glial, Totipotent cells proliferate on the Inner & Outer surface of the Retina
- o Contraction of Surface Membranes - Fixed Retinal Folds, Equatorial Traction, Anterior Loop Traction
- o Creates New Retinal Breaks, Reopens Old Breaks
- o Cause TRD

Grades of PVR

- Grade-A : Clouding of Vitreous Cavity
- Grade-B : Surface Wrinkling + Rolled or Irregular Edges of Breaks
- Grade-C : Full- thickness Rigid Retinal Folds
- Equator Divides Grade-C :
- (P) Posterior Form

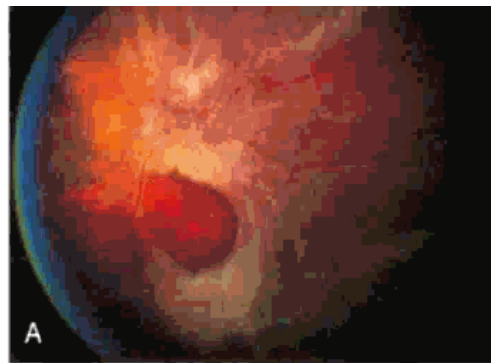
- (A) Anterior Form
- Extent of Proliferation Expressed in Clock Hrs 1-12
- PVR Grade-C - Types of Contraction
- Type -1:P Focal Contraction- Starfolds
- Type -2:P Diffuse Contraction, Confluent Irregular Fullthickness Retinal Folds-Disc not seen
- Type -3:P Sub-Retinal Proliferation + Fixed retinal Folds - "Napkin Ring"
- Type -4:A Irregular Circumferential Retinal Folds
- Type -5:A Smooth Circumferential Retinal Folds
- Type -6:A Anterior Displacement of Vitreous Base
- Anterior Loop Traction

PVR Clouding of Vitreous Cavity Grade A

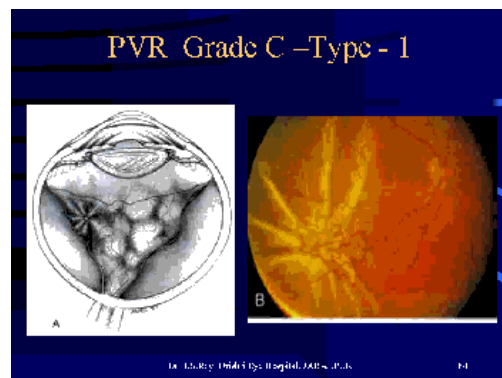




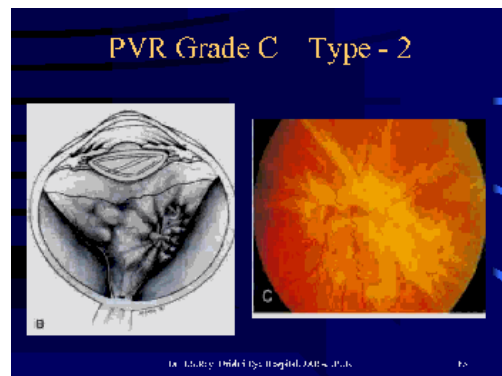
PVR Grade B



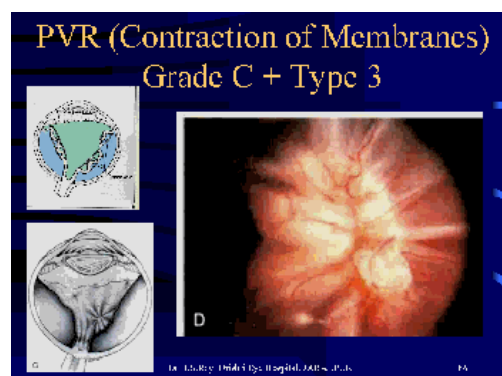
PVR Grade C -Type - 1



PVR Grade C - Type - 2

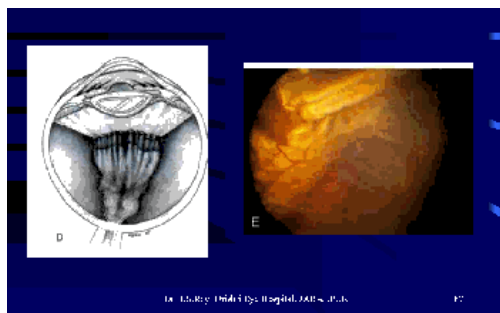


PVR (Contraction of Membranes)

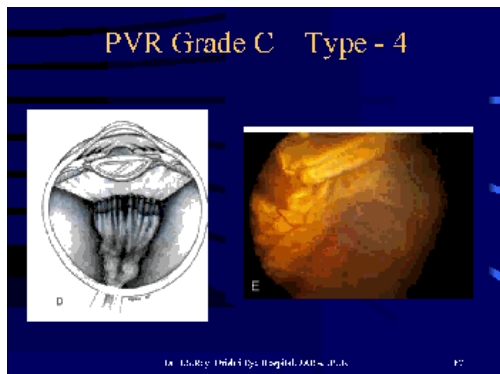


Grade C + Type 3

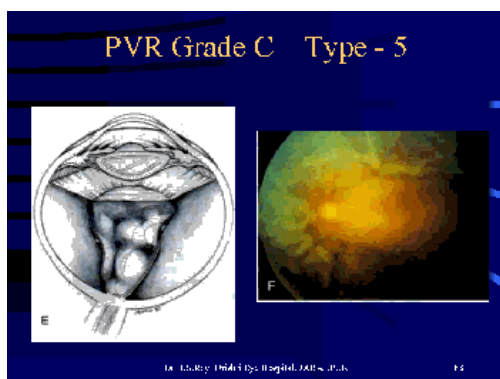
PVR Grade C Type - 4



PVR Grade C - Type - 4

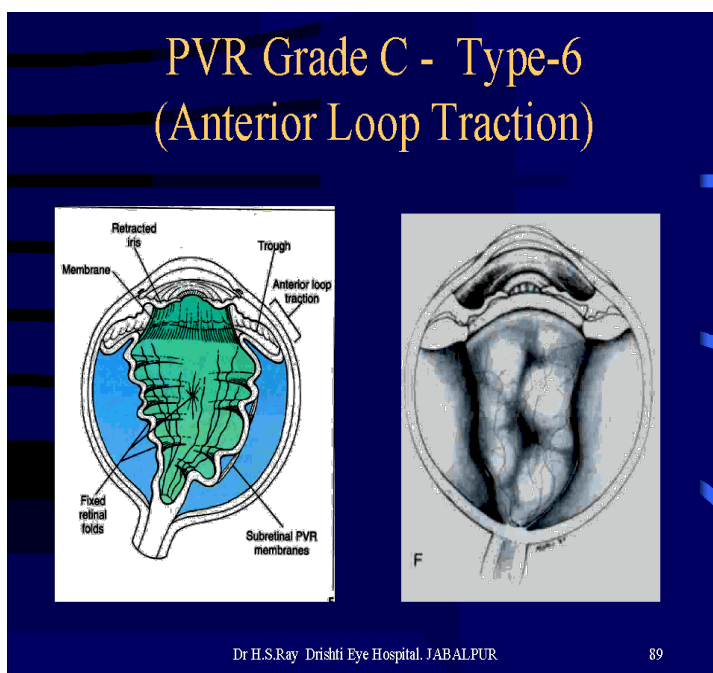


PVR Grade C - Type - 5



PVR Grade C - Type-6

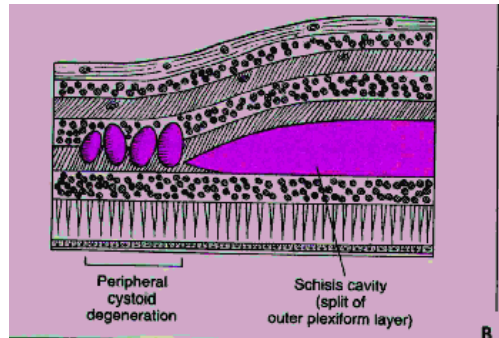
(Anterior Loop Traction)



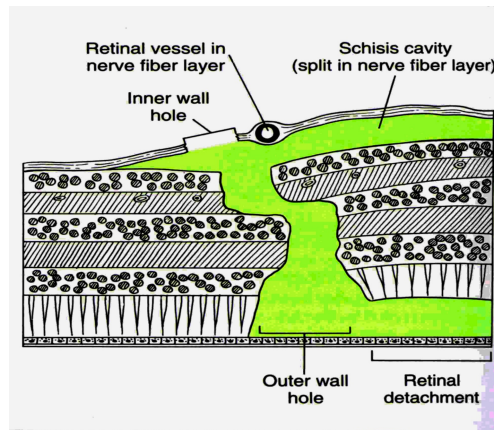
Retinoschisis

- o Acquired - Senile, Degenerative-Split-OPL & INL
- o Congenital - Juvenile, Hereditary, Developmental-Splits in NFL
- 3. Secondary -
 - Trauma, Battered Baby Syndrome
 - Fundus Disease: PDR, Regressed ROP, Sickle Cell Retinopathy, Occlusive Vascular Disease, Chronic RD, Optic Nerve Pit, Peripheral Uveitis, Tumours, Phakomatosis, Good Pasture's Synd.

Typical or Acquired Retinoschisis - OPL



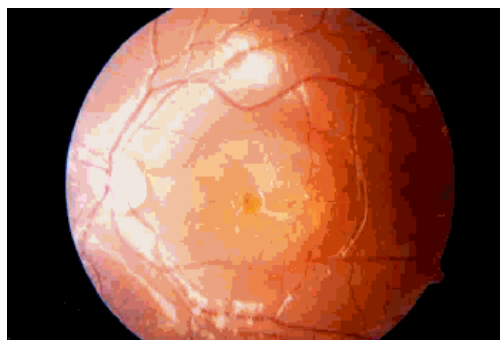
Reticular or Congenital Retinoschisis- NFL



Acquired Retinoschisis

- o More Common - 4% to 20% above 40 Yrs
- o Equally affects M & F
- o Splitting occurs in OPL & INL- Cystoid Degeneration.
- o Typical RS- Bullous
- o Reticular RS -Flat, Cystoid Degn.
- o Starts in Periphery Inferotemporal / Supratemporal
- o Outer Surface is smooth does not Undulate
- o White with Pressure (WWP) sign on Outer Layer
- o Outer Layer has multiple Reddish round spots Fish Egg
- o Inner Layer - Pitted Appearance on its back
- o Test - Indirect Ophthalmoscopic Perimetry

Optic Nerve Pit



DD of RRD / Retinoschisis

- o Degenerative Retinoschisis : Typical- Outer Plexiform or Reticular Type - Nerve Fibre Layer (Less Common)
- o Demarcation Lines or RPE Abnormalities not seen in Schisis cavity
- o Bubbling Shiny Appearance- Cystoid Degeneration.
- o Snowflake Frosty appearance- Muller Cell Foot Plate
- o Schisis Cavity is Dome Shaped -Thin Smooth Inner Wall
- o Schisis inner wall moves like Jelly -RD Undulates
- o RS asymptomatic No TabacoDust / Haemorrhage
- o Outer Layer develops Atrophic Holes Degenerative Retinoschisis

DD of RRD / Exudative RD

- o Breakdown of Blood-Retinal barrier
- o Serous Fluid bet RPE & Photoreceptors

Signs

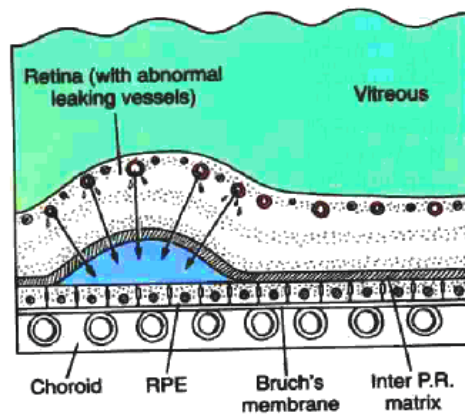
- o No Retinal Breaks
- o Smooth "Blister Like"
- o No Corrugations of Retinal Surface
- o Shifting Subretinal Fluids

Forces Predisposing to Ex RD

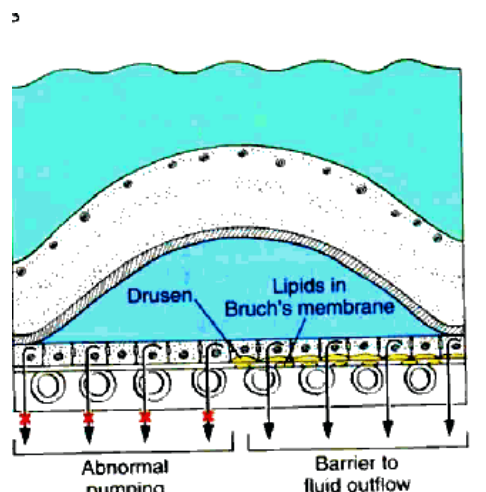
- o Inflammatory Disorders
- Harada's Dis, Sympathetic Ophthalmia, Ischaemia- Toxemia & Malignant HT,
- o Retinal Vascular Disorders Coats'Disease, Hemangioma, Sick RPE as in ARMD & CSR, Reduced Flow through Bruch's Membrane
- o Tumours - Melanoma, Ch Hemangioma, Metastases
- o Hemorrhage

Retinal Vascular Disorder - Coats' Dis. Hemangioma

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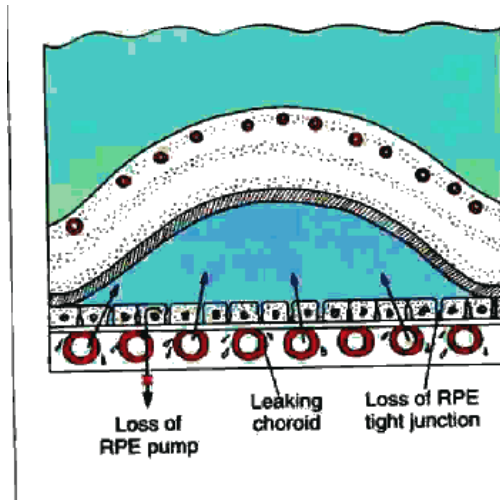


"Sick" RPE Pump & Bruch's Mem - Drusen

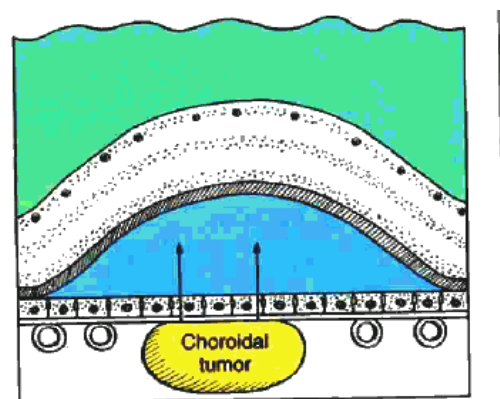


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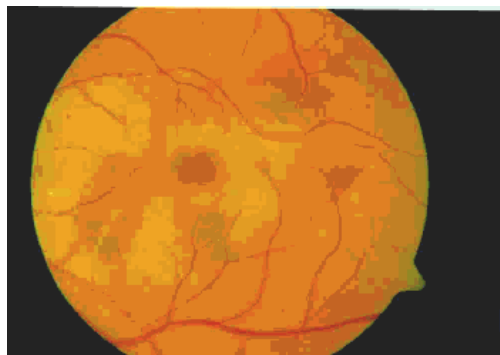
Choroidal Inflammation- Harada's Dis, Post. Scleritis, Sym. Ophthalmitis



Choroidal Tumours - Melanomas Hemangiomas



Exudative RD - Sub-Retinal Hge



Ex RD - Sub-Retinal Exudation / Hge
Exudative RD

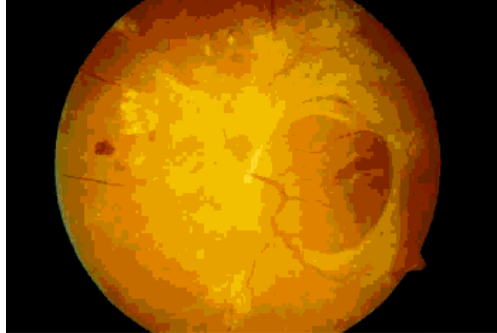




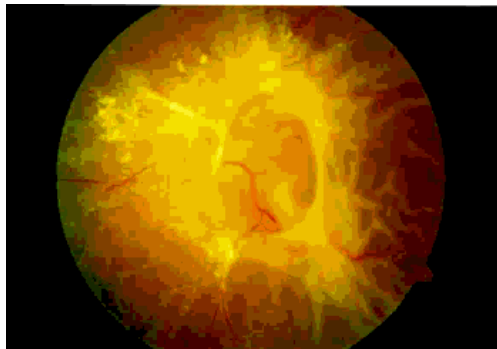
DD of RRD / Traction RD

- o Characteristic Concave Configuration
- o Vitreous Membranes / PVR Changes
- o Massive Subretinal Hem / Choroidal Tumours / RD must be differentiated

TRD



TRD - PDR



Forces Predisposing to TRD

- o Vascular Proliferative Retinopathy PDR, Sickle Cell Retinopathy, BRVO, ROP
- o Proliferative Vitreoretinopathy PDR
- o Scar Tissue Formation Penetrating Injury

DD of RRD / Uveal Effusion

CAUSES of Uveal Effusion:

- o Ocular Hypotony
- o Inflammation - Uveitis, Scleritis, Orbital Cellulitis, Laser or Cryotherapy, Surgical or Non-Surgical Trauma
- o Compromised Uveal, Scleral, Vortex Venous drainage
- o Dural Arteriovenous Fistula
- o Thickened Sclera - Nanophthalmos

DD of RRD / Uveal Effusion

Idiopathic Uveal Effusion Syndrome (IUES)

- o Exudative detachment of Peripheral Choroid, Ciliary Body, Peripheral Retina, or Macula in Normal sized eye. - Unlike Nanophthalmos

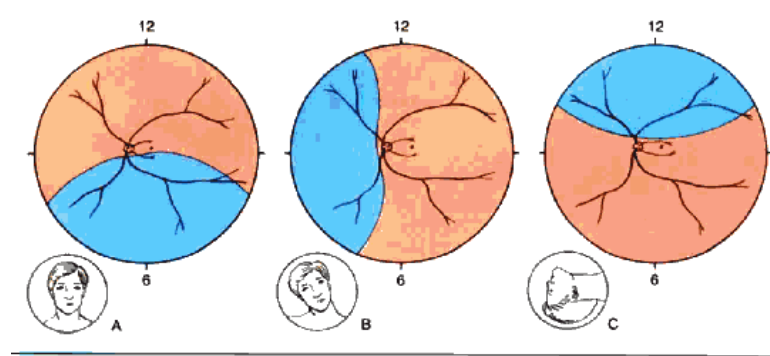
- o Healthy Middle Aged Males
- o Mild to Moderate Hyperopes
- o Second eye involvement- Weeks to Years
- o No Anterior Chamber Involvement
- o Prolonged Remission & Exacerbation of Ex RD
- o Secondary Leopard-Spot pattern of RPE
- o Reduced Vision -due to Chronic RD

DD of RRD / Choroidal Effusion

- o Shifting of Sub Retinal Fluid
- o Protein content 2 to 3 times of plasma

- o Pathogenesis not known
- o Thickened Sclera - Obstructing Venous Outflow
- o Vortex Vein Hypoplasia

Shifting of Fluid - Choroidal Effusion



Treatment for Choroidal Effusion

- o Idiopathic Form do not respond to Steroids
- o Or Surgical SRFD, Scleral Buckling
- o Thickened Sclera - Segmental Partial or Full Thickness "Window" Scleral Resection
- o Nanophthalmos: Vortex Vein Decompression

DD of RRD / Choroidal Detachment

- o Accumulation of Serous or Hemorrhagic Fluid between Choroid & Sclera
- o Normal apposition of Choroid & Sclera & Normal Fluid Transit in Supra-Choroidal space Depends on balance between Hydrodynamics & Oncotic Forces
- o Pressure in Supra-Choroidal space is lower than IOP - Hydrostatic Forces

Causes of Serous Choroidal Detachment

- o Hypotony or Vortex Vein Compression-
- o Scleral Buckling, Thick Sclera, Increased Ophthalmic venous Pressure
- o Altered Hydrostatic Forces
- o Abnormal Vascular Permeability
- o Surgical & Non-surgical Trauma, Ocular / Periocular Inflammation, Ischaemia

- o 3% after Cataract Sx,
- o 68% Transient Serous CD after LASER PRP

Signs of Serous Choroidal Detachment

- o Subtle AC Shallowing - Ciliary Body Rotation
- o Highly Elevated Smooth, Solid Orange Brown Lobes in the Retropupillary area
- o Absence of Retinal Breaks
- o Elevation of Pars plana
- o Smooth Lobular Contour of Elevation
- o USG- Suprachoroidal Serous Fluid- Rules out RD & Neoplasm
- o Hypotonic & Inflamed Eye
- o Often there is Exudative RD

Hemorrhagic Choroidal Detachment

- o Trauma
- o Immediate or Delayed Complication of Ocular Surgery

Signs of Immediate Suprachoroidal Hemorrhage

Signs:

- o Abrupt Rise of IOP
- o Shallowing of AC
- o Iris Prolapse
- o Dark Red-Brown Elevation behind Pupil
- o Expulsive Hemorrhage

Delayed Suprachoroidal Hge

Glaucoma Filtering Sx - Myopes & Aphakics

Symptoms: Pain, Nausea, & Vomiting

Signs:

- o Raised IOP
- o Flat AC
- o Loss of Red Reflex
- o Dark Lobes behind Pupil

- o Vitreous Hemorrhage may be associated
- o B-Scan - Suprachoroidal Echogenic Clot

Treatment of Choroidal Detachment

- o No T/T for Post surgical & Post Laser Choroidal Detachment
 - o Hypotony: Look for Wound Leak
 - o Inflammation: Steroids
 - o Shallow Ac., Risk of PAS., & Endothelial Damage : Drainage of Choroidal Detachment & Reform Anterior Chamber
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