RETINAL DETACHMENT (Rhegmatogenous)

Dr. H. S. Ray (M.S., Ophthalmology, FRF), Drishti Eye Hospital, Madan Mahal main road, Jabalpur-2  

Important Features of Retina

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

Forces of Retinal Adhesion

- Viscoelastic tamponade of Vitreous Gel.
- Hydrostatic Intraocular Pressure.
- Transretinal Fluid Gradient
- Interphotoreceptor Matrix (RPE), Acts as Glue
- Suction forces of RPE Pump. Bd Retinal Barrier
- 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

- 5.5mm in Diameter & Within Temporal Arcades
- Double Layered ganglion cells
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](image)

**Clinical Types of RD**

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

**Causes of Rhegmatogenous RD**

- Peripheral Retinal Lesions
- PVD - Age, Yag, Vit-He, Inflammation, DM
- Myopia
- Ocular Sx - Cataract, TPPV, PKP, Ant Vit
- Scleral Perforation
- Trauma
- Ocular Inflammation / Infection - CMV retinitis, ARN, Pars Planitis, Toxocara, Toxoplasma
- Coloboma of Choroid & Retina
- Retinoschisis - Senile & X-Linked Juvenile
Causes of Tractional RD

- PDR
- Sickle-Cell Retinopathy
- ROP
- Familial Exudative Vitreoretinopathy

Causes of Exudative RD
- Choroidal Tumours
- Harada’s Disease
- Posterior Scleritis
- Idiopathic Central Serous Chorioretinopathy
- Idiopathic Uveal Effusion Synd.
- Nanophthalmos
- Malignant Hypertension
- Toxemia of Pregnancy
- Collagen Vascular Disease
- Retinal Telangiectasia
- DIC, Optic Nerve Pit, Morning Glory Synd

OPTIC NERVE PIT - Pre-LASER/Post-LASER

Rhegmatogenous RD

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

Symptoms of RD

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

Signs Of RD

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

Types of Retinal Breaks

- Horse Shoe Tear (Flap Tear) (aka HST)
- Arrow Head Tear
- Arrow Head Tear
- Operculated Tear - Strong Vit Traction
- Giant Retinal tears - 90 Degree or more
- Retinal Dialysis - Posterior Edge is Attached to the Vit Base - No Curling
- 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

- Lattice Degeneration
- Vitreoretinal Tufts
- Meridional Folds

1. Lattice Degeneration

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

Pathogenesis of Lattice Degeneration

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

Schematic of Lattice Degeneration

Management of Lattice Degeneration

- Lattice without Retinal Breaks - No Rx
- Lattice with Atrophic Holes - No Rx
- Lattice + Holes+ Sub clinical RD - Treat
- Lattice+ Traction Tear - Treat : If Fellow eye has RD
- Strong Family History of RD
- Aphakic Eyes
- Asymptomatic Traction Tear - No Rx
- 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 Degn. 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 Chriocapillaries
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
3. RPE Hyperplasia

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

4. Congenital Hypertrophy of RPE

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

Carcinoma COLON

Vitreous Conditions / PVD

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

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

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

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

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

Treatment of RRD

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

Examination of Retina

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

Retinal Diagram Image

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

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

Pneumatic Retinopexy

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

Indications of Pneumo-Retinopexy

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

Contraindication of PR

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

Complications of PR

- New or Missed Breaks, Reopening of Breaks
- PVR changes
- Redetachment
- Persistent SRF
- 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, Totepotent 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)

PVR (Contraction of Membranes) Grade C + Type 3

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

- Acquired - Senile, Degenerative-Split: OPL & INL
- 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**

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

Optic Nerve Pit
DD of RRD / Retinoschisis

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

DD of RRD / Exudative RD
- Breakdown of Blood-Retinal barrier
- Serous Fluid bet RPE & Photoreceptors

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

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

Retinal Vascular Disorder - Coats' Dis. Hemangioma
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
- Characteristic Concave Configuration
- Vitreous Membranes / PVR Changes
- Massive Subretinal Hem / Choroidal Tumours / RD must be differentiated

TRD

Forces Predisposing to TRD
- Vascular Proliferative Retinopathy PDR, Sickle Cell Retinopathy, BRVO, ROP
- Proliferative Vitreoretinopathy PDR
- Scar Tissue Formation Penetrating Injury

DD of RRD / Uveal Effusion

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

DD of RRD / Uveal Effusion
Idiopathic Uveal Effusion Syndrome (IUES)
- Exudative detachment of Peripheral Choroid, Ciliary Body, Peripheral Retina, or Macula in Normal sized eye. - Unlike Nanophthalmos
- Healthy Middle Aged Males
- Mild to Moderate Hyperopes
- Second eye involvement- Weeks to Years
- No Anterior Chamber Involvement
- Prolonged Remission & Exacerbation of Ex RD
- Secondary Leopard-Spot pattern of RPE
- Reduced Vision -due to Chronic RD

DD of RRD / Choroidal Effusion
- Shifting of Sub Retinal Fluid
- Protein content 2 to 3 times of plasma
Pathogenesis not known
- Thickened Sclera - Obstructing Venous Outflow
- Vortex Vein Hypoplasia

Shifting of Fluid - Choroidal Effusion

![Diagram of choroidal effusion](image)

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

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

Causes of Serous Choroidal Detachment
- Hypotony or Vortex Vein Compression-Scleral Buckling, Thick Sclera, Increased Ophthalmic venous Pressure
- Altered Hydrostatic Forces
- Abnormal Vascular Permeability
- Surgical & Non-surgical Trauma, Ocular / Periocular Inflammation, Ischaemia
- 3% after Cataract Sx,
- 68% Transient Serous CD after LASER PRP

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

Hemorrhagic Choroidal Detachment
- Trauma
- Immediate or Delayed Complication of Ocular Surgery

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

Delayed Suprachoroidal Hge
Glaucoma Filtering Sx - Myopes & Aphakics
- Symptoms: Pain, Nausea, & Vomiting
- Signs:
  - Raised IOP
  - Flat AC
  - Loss of Red Reflex
  - Dark Lobes behind Pupil
Vitreous Hemorrhage may be associated
B-Scan - Suprachoroidal Echogenic Clot

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