Peripheral Retina Abnormalities: with Emphasis on Retinal Detachment

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Overview of the anatomy of the pars plana, ora serrata, vortex veins, ciliary nerves, and macula.
The Peripheral Retina

- Long Ciliary artery and nerve
- Vortex veins
- Ora Serrata
- Pars Plana
- Pars Plicata
The Peripheral Retina

- Long Ciliary artery and nerve
- Vortex veins
  - Divides Fundus into Posterior and Peripheral Retina
  - Anatomical equator is 3mm anterior to entrance
- Ora Serrata
- Pars Plana
- Pars Plicata
The Peripheral Retina

- Long Ciliary artery and nerve
- Vortex veins
- Ora Serrata
- Pars Plana
- Pars Plicata
Ora Serrata

- Ora Serrata Region
  - More pronounced dentate processes nasally
  - 3DD wide, 1DD anteriorly, 2DD posteriorly
  - Sensory retina -> nonpigmented ciliary epithelium

- Pars Plana
- Pars Plicata
Ora Serrata

- Ora Serrata Region
- **Pars Plana**
  - Asymmetrical (wider temporally)
  - Average 4mm width (from ora serrata to ciliary crest)
  - Entrance for Vitrectomy
- **Pars Plicata**
Ora Serrata

- Ora Serrata Region
- Pars Plana
- **Pars Plicata**
  - contains 73 ciliary processes
  - Production of aqueous humor
  - Ciliary muscles
Vitreous
Vitreous Base

- Extends 1.5 mm anteriorly
- Extends 1.8 temporally, and 3 mm nasally posteriorly to ora serrata
- Firm attachment of:
  - Sensory retina
  - RPE
  - Vitreous Base
- Consists of 99% water, hyaluronic acid, salts, collagen fibrils, proteins
Examination

- Indirect Ophthalmoscopy
- Three mirror contact lens
- Wide angle contact lens
- Transillumination
Indirect Ophthalmoscopy

- Steropsis
- Less distortion
- Better visualization in eyes with hazy view
- Wide field of view
- Readily perform scleral depression
Three Mirror Contact Lens

- Excellent visualization
- Readily view ora serrata and pars plana
- Good visualization of overlying vitreous
- Limited field of view
Wide Angle Contact Lens

- Excellent field of view
- Distortion in periphery
- Poor depth perception
- Low resolution
Peripheral Retina: Retinal Detachment

- Separation between sensory retina and retinal pigment epithelium
- Four types:
  - Rhegmatogenous
  - Exudative
  - Tractional
  - Complex
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Rhegmatogenous Retinal Detachment

1. Retinal break
2. Hydrostatic forces
3. Liquefied vitreous
4. Traction

* University of Toronto Schema
  (Break-Fluid-Fluid-Traction)
Rhegmatogenous Retinal Detachment

1. Retinal break
   - rhegma = break
   - often caused by PVD
2. Hydrostatic forces
3. Liquefied vitreous
4. Traction
Rhegmatogenous Retinal Detachment

1. Retinal break
2. **Hydrostatic forces**
   - RPE pump, intraocular pressure, osmotic pressure
3. Liquefied vitreous
4. Traction
Rhegmatogenous Retinal Detachment

1. Retinal break
2. Hydrostatic forces
3. Liquefied vitreous
   - Offers access point
   - Enters through break
4. Traction
Rhegmatogenous Retinal Detachment

1. Retinal break
2. Hydrostatic forces
3. Liquefied vitreous
4. **Traction**
   - Mechanical forces
   - Ocular saccades
RRD: Incidence

- Rate approximately 1 in 10,000 / year
- Lifetime estimated, at 0.06 %
- Incidence of Retinal Breaks is 3.3 %
  /year
  - => so, risk of RD is 1:330
- Common age range 40-70 years old
RRD: Findings

- Tear found in 97% of the cases
- 10% from asymptomatic retinal break
- 50% have floaters or photopsia
- + Shafer’s sign (tobacco dust)
- Lowered IOP
- Corrugated retinal folding
RRD: Common Risk Factors

- Myopia
- Aphakia
- Trauma
- RD in fellow eye (15%)
- Family history of RD
- Peripheral Lesions
- Systemic (Goldmann-Favre, Stickler’s)
RRD: Common Risk Factors

- **Myopia**
  - 1-3D, risk 4x population
  - > 3D, risk 10x population
- **Aphakia**
- **Trauma**
- **RD in fellow eye**
- **Family history of RD**
- **Peripheral Lesions**
- **Systemic (Goldmann-Favre, Stickler’s)**
RD: after Cataract Extraction

- Surgical complications increase risk

• Norregaard, BJ O 1996

*Figure 1*  Cumulative risk of retinal detachment (RD) following cataract extraction according to surgical technique in a Danish cataract sample. ICCE=intracapsular cataract extraction, ECCE=extracapsular cataract extraction, IOL=intracocular lens.
RRD: Prevention

- Recognition of acute PVD signs
- Assess Risk Factors
- Identify peripheral pathology
- Treatment of “high risk” tears
- Patient Education
RRD: Prevention

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Vitreous

- Posterior vitreous detachment (PVD)
  - Vitreous liqufication (syneresis)
  - Firm attachment at vitreous base, optic nerve, paravascular
Vitreous - PVD

- Posterior vitreous detachment (PVD)
  - Separation from Optic Nerve.
  - If other locations, consider another mechanism (e.g., Inflammatory)
PVD Symptoms

- **Flashes**
  - Caused by vitreous traction
  - Not location specific

- **Floaters**
  - Single spot
  - Strands
  - Cobweb
  - Sand storm

- **Visual Field Loss = RD**
PVDPVD

Prevalence associated with:

- Age (63% at 70 yo)
- Axial length / Myopia
- Aphakia
- Pseudophakia / Vitreous Loss
- Inflammatory Disease
- Trauma
PVD - importance
PVD + Retinal Break

- 10-15% with **acute symptoms** have retinal break(s)
  - New retinal break found in 2%, esp if hemorrhage, or, new symptoms
  - Development of RD unlikely if no retinal tears found in 4-6 weeks

- 50-70% with acute symptoms and vitreous hemorrhage have retinal breaks
  - Avulsion of overlying vessel
  - Paripapillary vessel
PVD + Retinal Break

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Which Retinal Breaks to Treat?

- Retinal Dialysis
  - Always
- Horshoe tears
  - Always
- Operculated Hole
  - Symptomatic: Sometimes
  - Asymptomatic: Rarely
- Atrophic hole
  - Rarely
- Lattice degeneration
  - Rarely

* Modified AAO, Preferred Practice Pattern, 2003
Lesions not predisposing to RD

- Cobblestone degeneration
- Peripheral cystoid degeneration
- White with/without pressure
- RPE Hyperplasia
- RPE Hypertrophy
- Pars plana cysts

• From Dr. H. Riley / Indiana University
Lesions not predisposing to RD

- Cobblestone degeneration
  - Multiple, round, area of choroidal, retinal atrophy
  - Often bilateral
- Peripheral cystoid degeneration
- White with/without pressure
- RPE Hyperplasia
- RPE Hypertrophy
- Pars plana cysts
White Without Pressure
Lesions predisposing to RD

- Lattice degeneration
- Cystic retinal tuft
- Meridonal folds
- Enclosed ora bays
- Degenerative Retinoschisis
Lesions predisposing to RD

- Lattice degeneration
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Lattice Degeneration

- Found in 8% of the population, bilateral in 45%
- Risk to RD in 5%; with Myopia ~ 25%
- Often in myopia, familial pattern
- 30% of patients with RD have lattice
Lattice Degeneration

- Often found midway between ora serrata and the equator
- Circumferential area with criss-crossing white lattice lines (hyalinized blood vessels)
  - Perivascular and radial (eg. Stickler’s syndrome)
Lattice Degeneration

- No ILM (#1);
  retinal thinning;
  overlying vitreous liquefaction (#3);
  adherence at borders (#4)
Lesions predisposing to RD

- **Lattice degeneration**
  - Risk to RD ~ <1%

- **Cystic retinal tuft**
  - Round elevation, glial tissue
  - 5% in autopsy, bilateral in 20%
  - Risk to RD ~ 0.28%

- **Meridonal folds**

- **Enclosed ora bays**
Lesions predisposing to RD

- Lattice degeneration
  - Risk to RD ~ <1%
- Cystic retinal tuft
- Meridonal folds
  - Redundant fold of retina to pars plicata processes
  - May have associated posterior break
  - Superior nasal common
- Enclosed ora bays
Retinal Breaks

- Horseshoe tear
- Operculated Hole
- Atrophic Hole
- Giant Retinal Tear
- Macular hole
- Dialyses
Retinal Breaks

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Retinal Breaks

- Horseshoe tear
- Operculated Hole
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- **Dialyses**
  - Full thickness disinsertion at the ora serrata
  - Often associated with blunt trauma
Treatment of Retinal Breaks

- 30-50% of symptomatic horseshoe tears result in RD, vs those treated to 5%
  
- Follow up closely, since new retinal breaks occur in 8%
Treatment: Laser Retinopexy

- Applied either with Indirect Ophthalmoscope, or Contact Lens
- 5-7 days for adhesion
scar forms in 5-7 days

new user, 10/26/2008
Differential Diagnosis of Retinal Detachment

- Retinoschisis
- Vitreous Hemorrhage
- Choroidal Lesions
  - Choroidal Detachment
  - Choroidal Melanoma
Retinoschisis
Differential Diagnosis of Retinal Detachment

- Retinoschisis
- Vitreous Hemorrhage
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  - Choroidal Detachment
  - Choroidal Melanoma
Repair of Retinal Detachment

- Basically five options:
  - Retinopexy (Laser or Cryotherapy)
  - Pneumatic Retinopexy
  - Balloon
  - Scleral Buckle
  - Pars Plana Vitrectomy

- Success approaches 90-95%
Repair of Retinal Detachment

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Retinal Detachment: Macular Status

- Visual prognosis good if macula on (87% ≥ 20/50)
- Prognosis guarded if macula off (50% ≥ 20/50)
- Prognosis related to macula off duration (??, age)
Retinal Detachment: Duration
Pneumatic Retinopexy

- Limited to Superior detachments
- Positioning requirement
Scleral Buckle

- Indents eye from outside to reappose retina
- Need to be able to visualize all breaks
- Variations:
  - +/- Drainage
  - Encircling vs. Radial Band
Pars Plana Vitrectomy

- Versatile
- Various gauges: 20g, 23g, and 25g
Pars Plana Vitrectomy

- Versatile
- Various gauges: 20g, 23g, and 25g
Giant Retinal tear

- Defined as greater than 3 clock hours
- Bilateral GRT especially in high myopes, Stickler’s syndrome
Replacements

- Fluid
- Air
- Gas: SF6, C3F8
- Silicon Oil
Peripheral Retina Summary

- Anatomy
- Examination
- Retinal Detachment
  - Types
  - Vitreous
  - Retinal Breaks
  - Risk Factors
  - Introduction to RD Repair
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*Defined as a tear extending ≥ 3 clock hours*
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Peripheral Retina

Thank You!