



Complications of prematurity:  
“ROP”

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# Complications of prematurity

## Acute

- ◆ RDS
- ◆ Pulmonary Interstitial Emphysema (PIE)
- ◆ Pneumothorax
- ◆ Patent Ductus Arteriosus
- ◆ Necrotizing enterocolitis (NEC)
- ◆ ***Intra-ventricular hemorrhage (IVH)***
- ◆ Multiple transfusions
- ◆ Bacterial and fungal infections

# Retinopathy of prematurity (ROP)

## Normal development

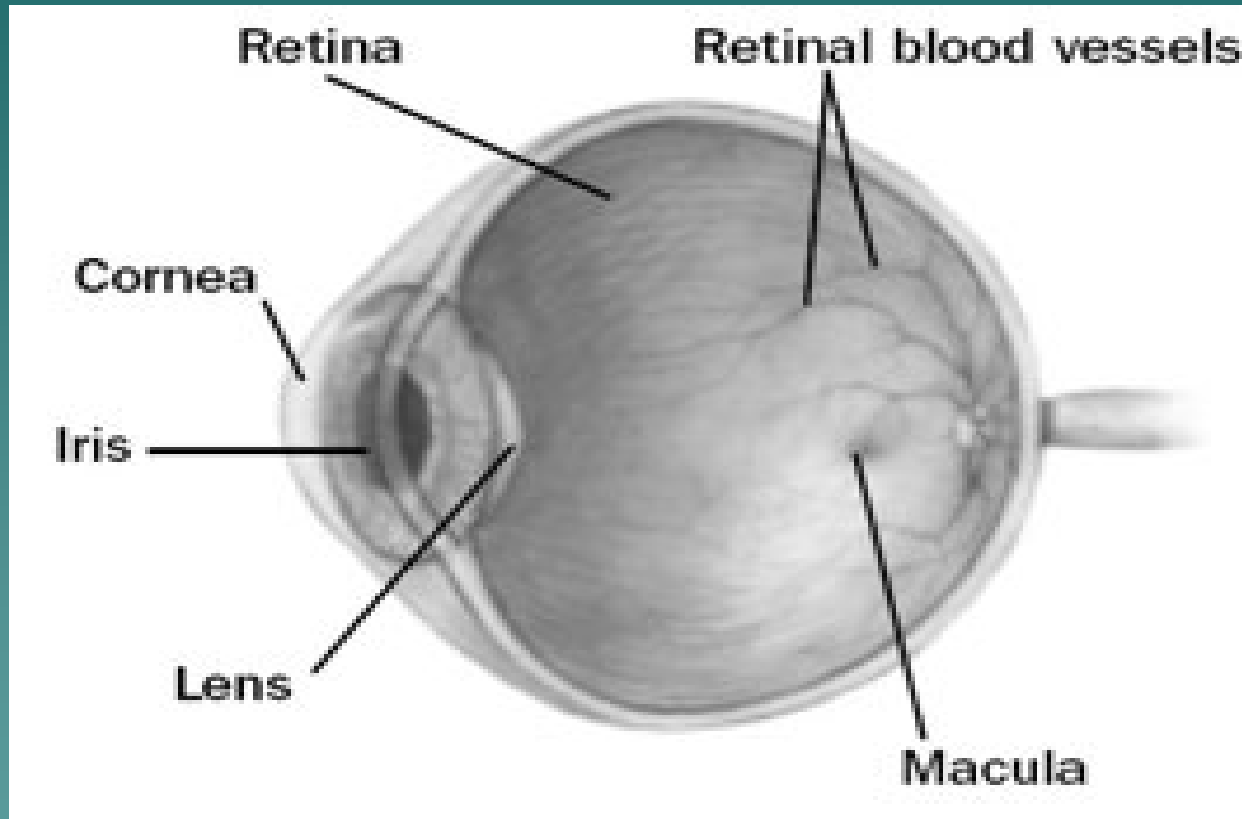
- ◆ After scleral and choroidal development, retinal elements migrate from optic disk towards periphery
- ◆ Photoreceptors have migrated 80% of their resting place at ora serrata by 28 weeks gestation
- ◆ Before retinal vessels develop, avascular retina receives O<sub>2</sub> by diffusion across retina from choroidal vessels

# Retinopathy of prematurity (ROP)

## Normal development

- ◆ Retinal vessels begin to migrate outward from optic nerve disk at 16 weeks gestation
- ◆ Migration is complete by 36 weeks on the nasal side and by 40 weeks on the temporal side

# Retinopathy of prematurity (ROP)



# Retinopathy of prematurity (ROP)

Pathogenesis occurs in 2 stages:

- ◆ Primary stage:
- ◆ Insults such as hyperoxia, hypoxia or hypotension at critical point in retinal vascularization cause arrest in vascular development
- ◆ Relative hyperoxia at birth down regulates production of growth factors essential for normal retinal vessel development

# Retinopathy of prematurity (ROP)

## Second stage:

- ◆ abnormal neovascularization driven by excess angiogenic factors released by ischemic relatively hypoxic avascular retina
- ◆ New vessels grow through retina into vitreous
- ◆ These vessels are permeable and edema can occur
- ◆ Extensive/severe extraretinal fibrovascular proliferation can lead to retinal detachment and abnormal retinal function

# Retinopathy of prematurity (ROP)

## Risk factors: many associations

- ◆ Most consistent: low gestation, low birth weight and duration of mechanical ventilation
- ◆ Vitamin E deficiency, multiple blood transfusions, IVH
- ◆ BPD, O<sub>2</sub> exposure, blood O<sub>2</sub> fluctuations
- ◆ Sepsis

# Retinopathy of prematurity (ROP)

## Screening and diagnosis

- ◆ No early signs or symptoms
- ◆ Early and regular exam necessary
- ◆ Timing of ROP related to maturity of retinal vessels and thus postnatal age

# Retinopathy of prematurity (ROP)

## Screening and diagnosis

- ◆ All newborns  $<1500\text{g}$  or  $\leq 32$  weeks gestation at birth regardless of  $\text{O}_2$  need
- ◆ At 5-6 weeks age (or at 31 weeks post-conceptual age whichever comes last)
- ◆ Selected newborns between 1500-2000g or 32-34 weeks who have had unstable course should be considered for evaluation

# Retinopathy of prematurity (ROP)

## Screening and diagnosis



# Retinopathy of prematurity (ROP)

## Classification

- ◆ Location
- ◆ Severity
- ◆ Plus
- ◆ Extent

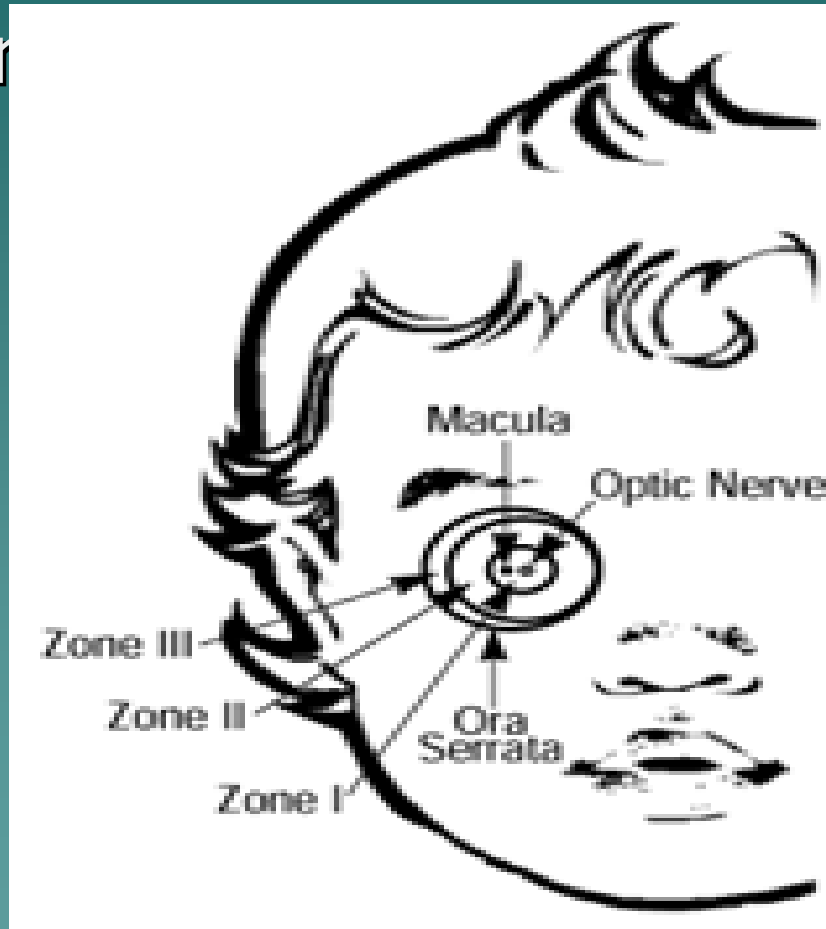
# Retinopathy of prematurity (ROP)

## Location

- ◆ **Zone I** (posterior pole or inner zone): A circle with radius extending from optic disc to twice the disc-macula distance
- ◆ **Zone II** (middle zone): from zone I peripherally to the edge of retina on nasal side and around to near temporal equator
- ◆ **Zone III** (outer zone): residual crescent of retina anterior to Zone II, least vascularized and most frequently involved in ROP

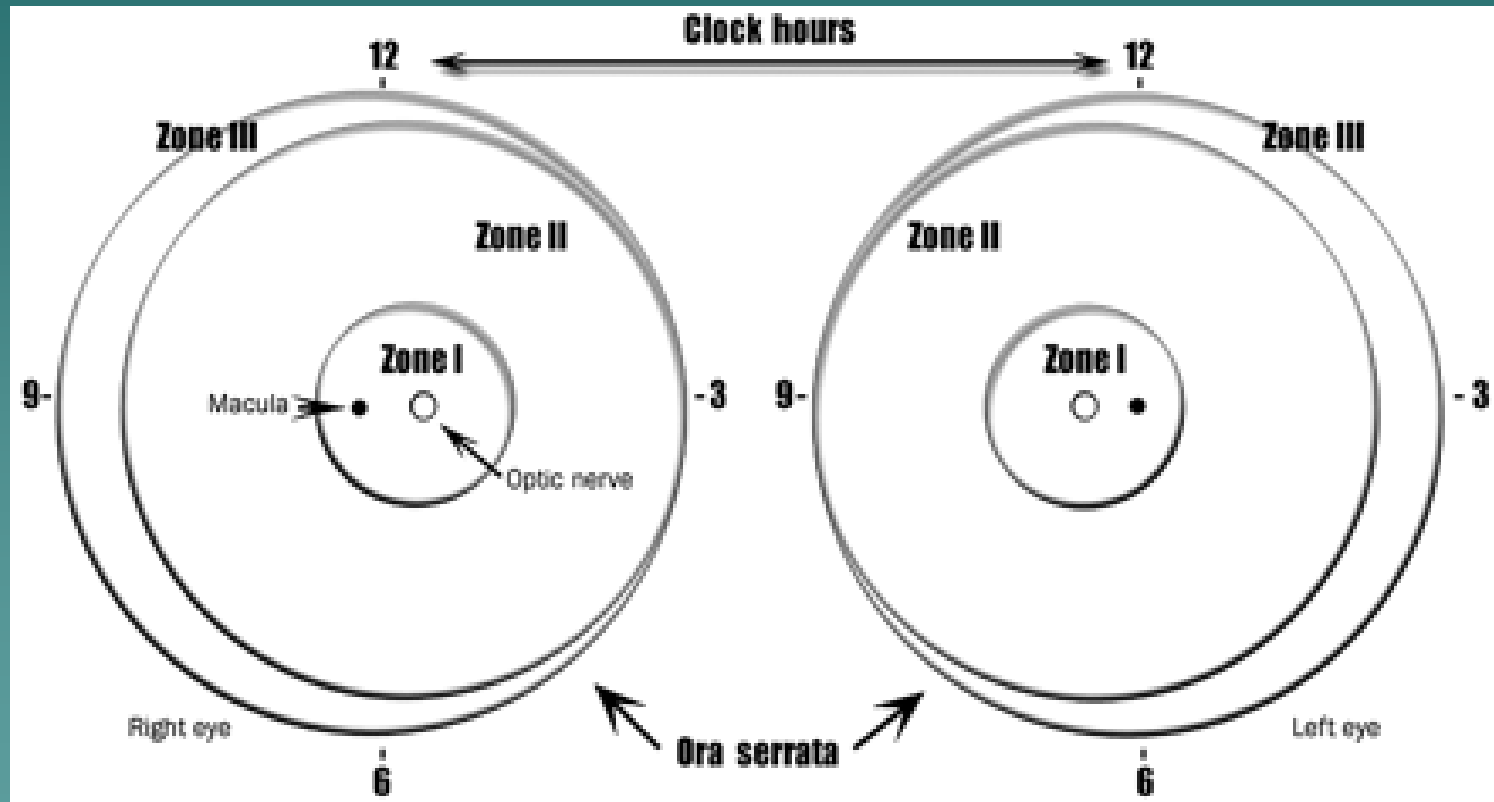
# Retinopathy of prematurity (ROP)

## ◆ Location



# Retinopathy of prematurity (ROP)

## ◆ Location



# Retinopathy of prematurity (ROP)

## Severity: staging

- ◆ **Stage I:** *demarcation line* which is a thin white flat line that separates the normal vascularized posterior retina from undeveloped avascular anterior retina
- ◆ **Stage II:** *Ridge of scar tissue* with increased volume extends out of retinal plane. Isolated vascular tufts may be seen posterior to the ridge

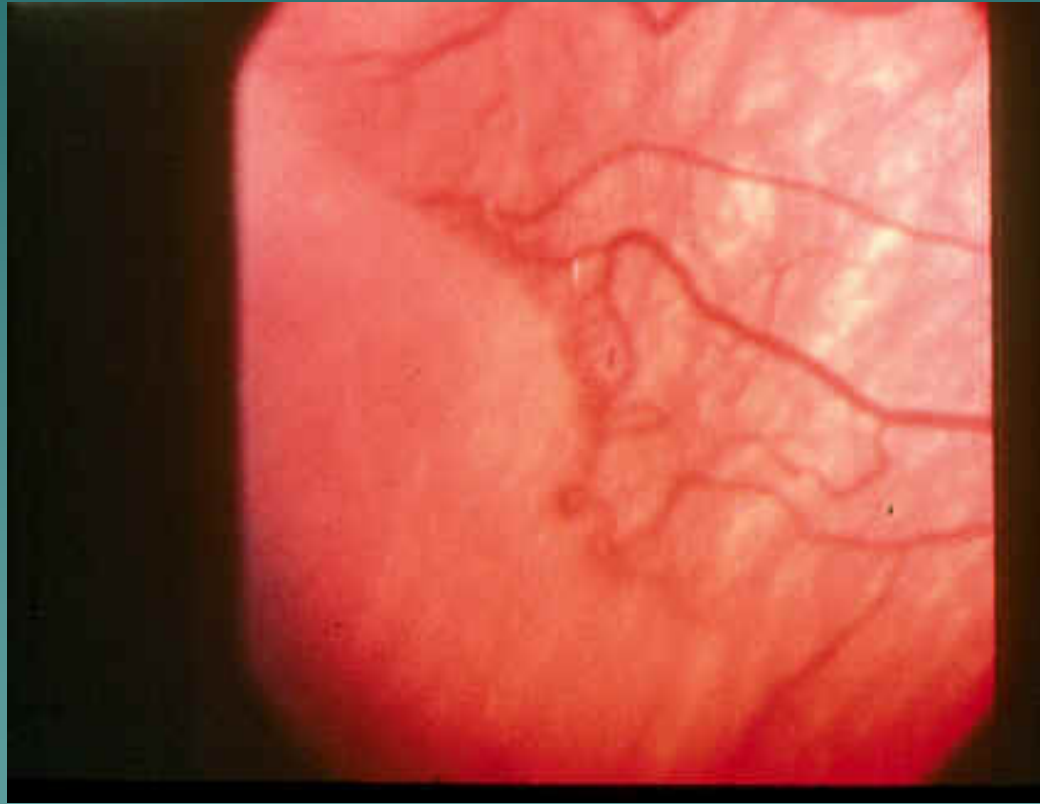
# Retinopathy of prematurity (ROP)

## Severity: staging

- ◆ ***Stage III***: Ridge with extraretinal fibrovascular proliferation
- ◆ ***Stage IV***: Subtotal retinal detachment (extrafoveal or involving the fovea)
- ◆ ***Stage V***: total retinal detachment

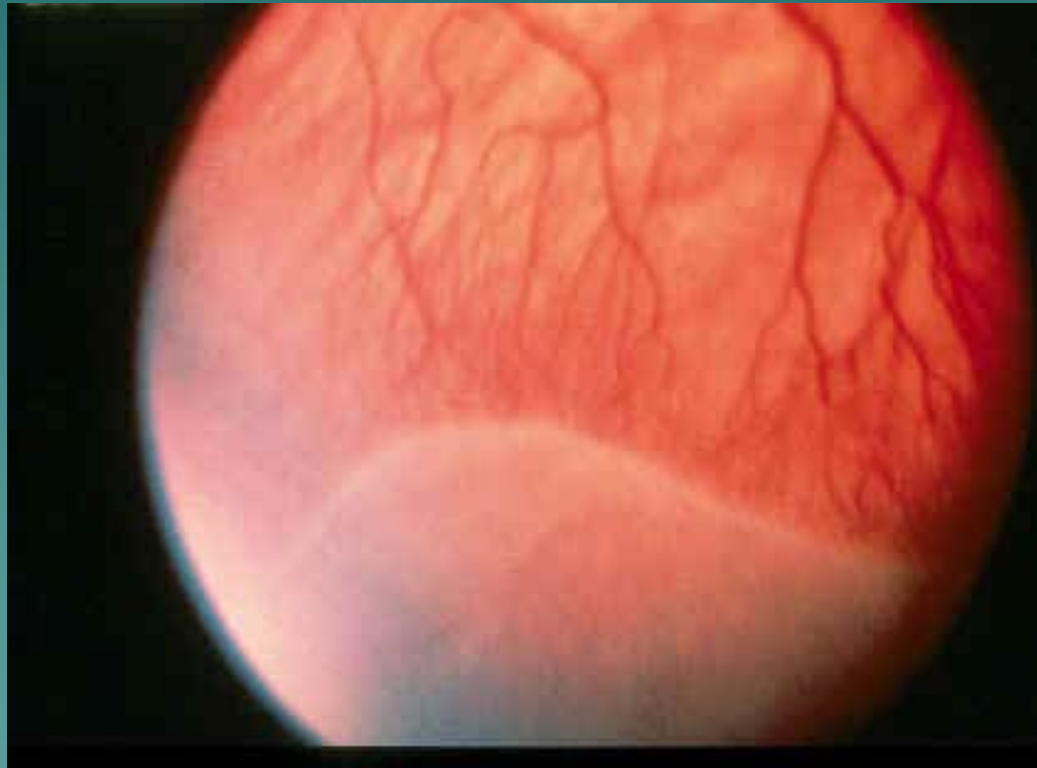
# Retinopathy of prematurity (ROP)

Stage I



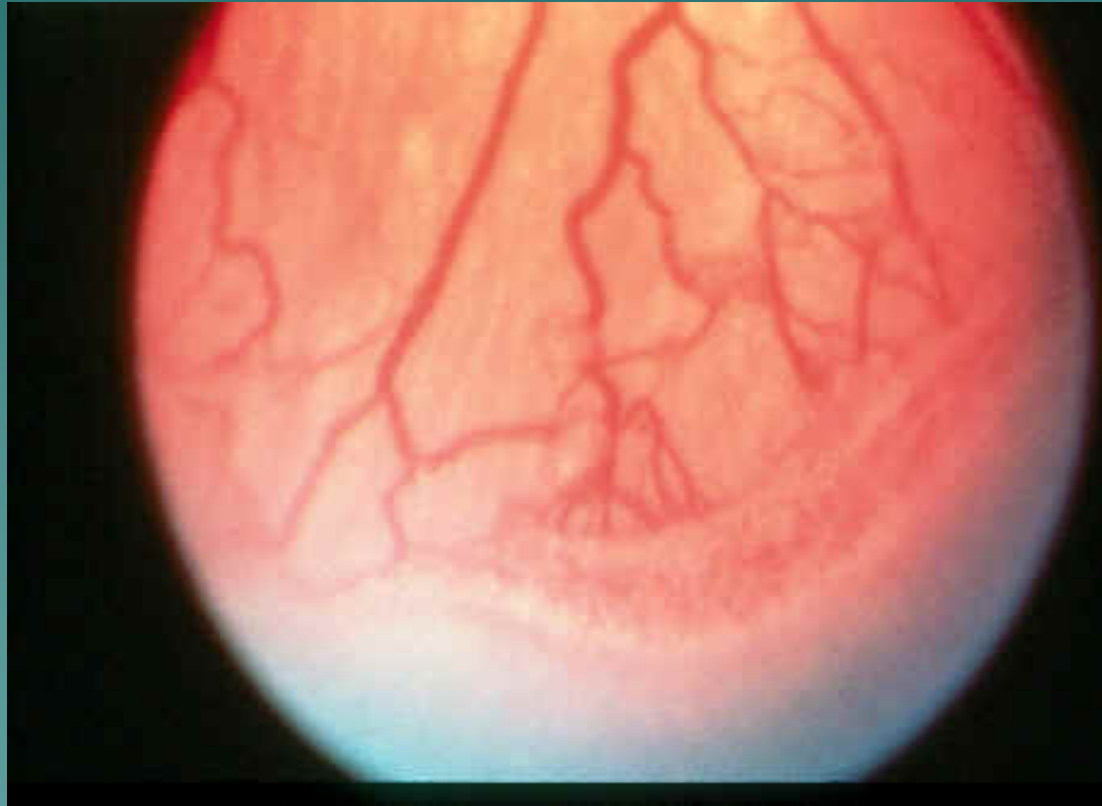
# Retinopathy of prematurity (ROP)

## Stage II



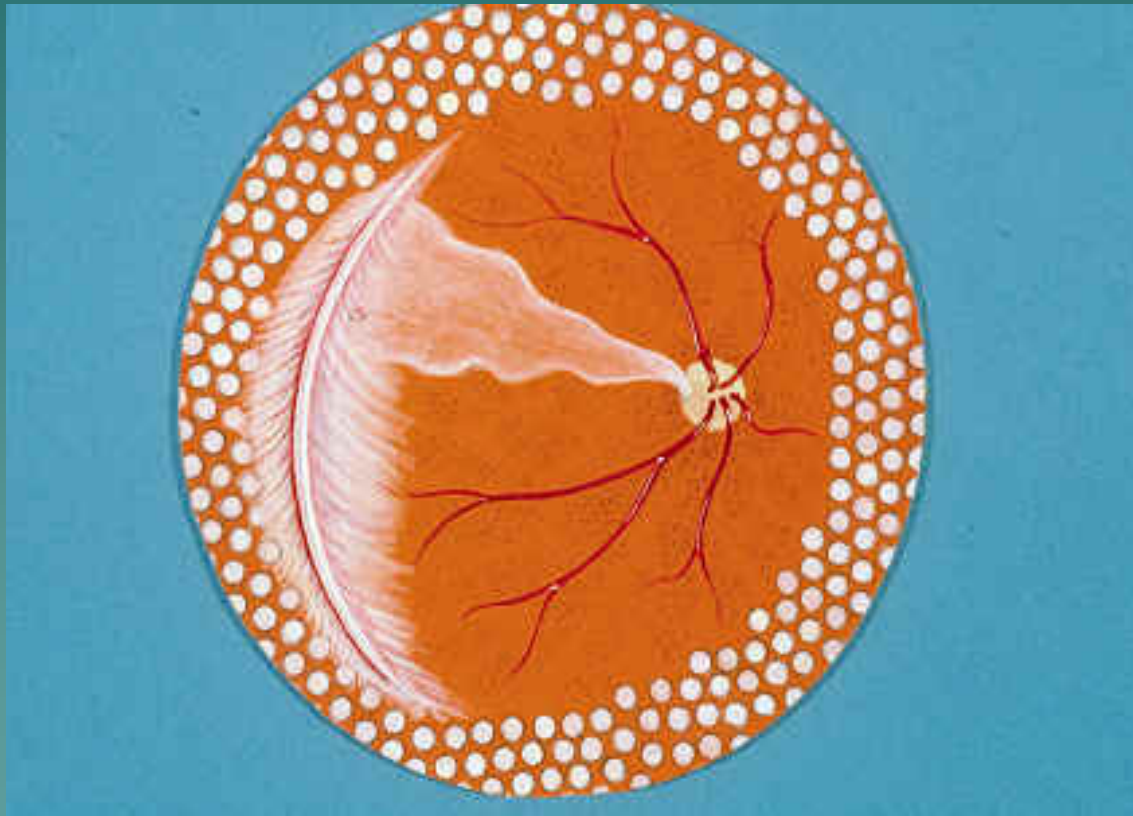
# Retinopathy of prematurity (ROP)

Stage III



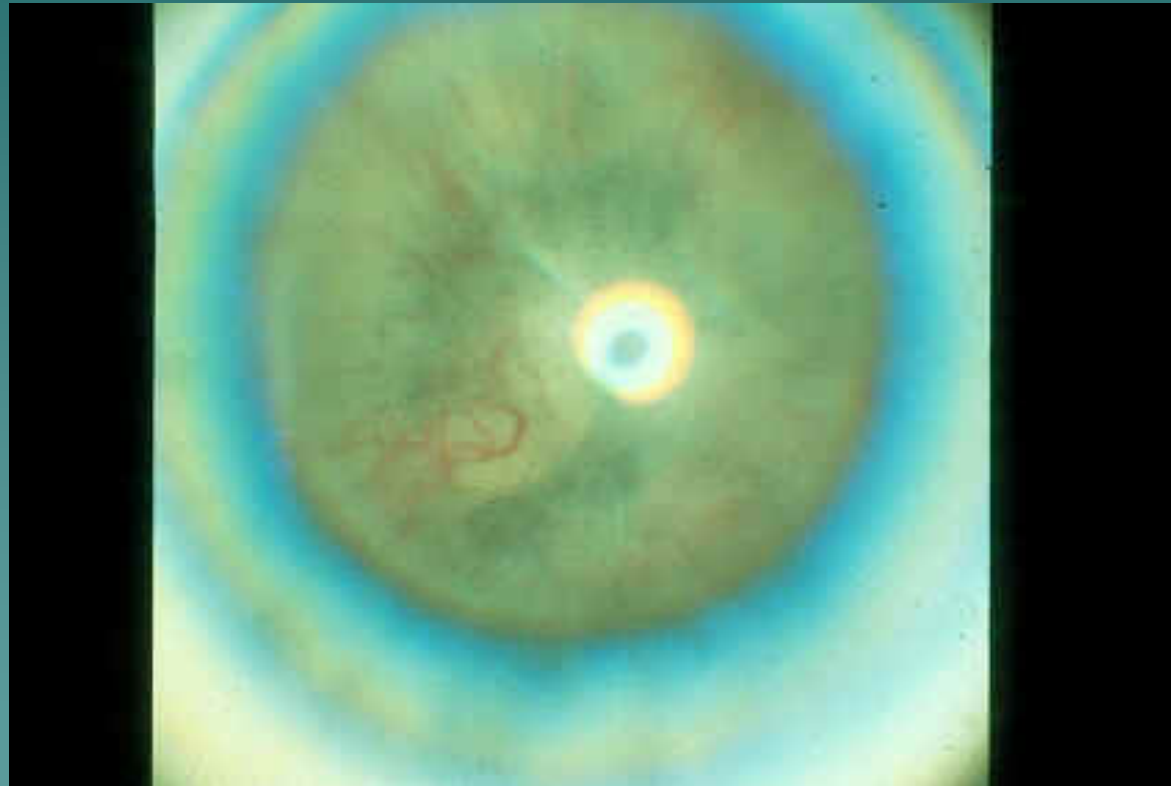
# Retinopathy of prematurity (ROP)

## Stage IV



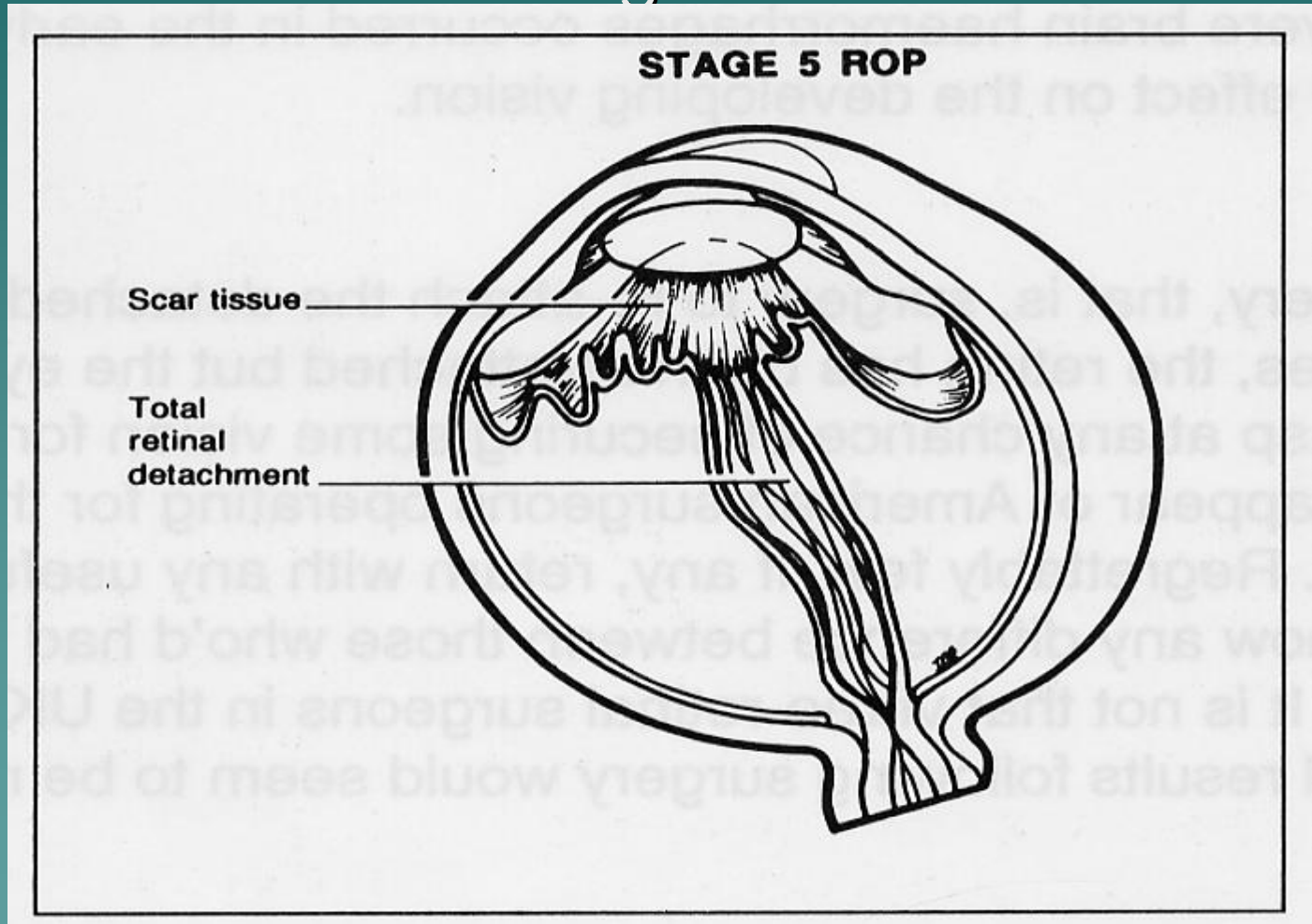
# Retinopathy of prematurity (ROP)

Stage V



# Retinopathy of prematurity (ROP)

## Stage V



# Retinopathy of prematurity (ROP)

## Plus disease

- ◆ Sign of vascular activity which can accompany any stage
- ◆ Indicates greater likelihood of progression to stage III
- ◆ Characterization by tortuosity and engorgement of retinal vessels, vascular engorgement and rigidity of iris and vitreous haze

# Retinopathy of prematurity (ROP)

## Extent of ROP

- ◆ Recorded in “clock hours” on each eye in the appropriate zone

# Retinopathy of prematurity (ROP)

## Pre-threshold ROP

- ◆ ROP with increased likelihood of progression to retinal detachment if left untreated (zone I any stage or Zone II, “plus” disease with stage II or III)

## Threshold ROP

- ◆ 5 or more contiguous or 8 cumulative clock hours of stage III with “plus” disease in either Zone I or II

# Retinopathy of prematurity (ROP)

## Treatment

- ◆ Laser photocoagulation for those progressing to pre-threshold or threshold disease
- ◆ Cryotherapy
- ◆ Retinal reattachment

# Retinopathy of prematurity (ROP)

## Outcome

- ◆ Stage I and II: usually undergo spontaneous regression by 11 to 16 weeks post natal age
- ◆ Treatable abnormalities such as strabismus, amblyopia and refractive errors may occur
- ◆ Stage III and IV: strabismus, amblyopia and glaucoma may occur. Retinal detachment possible. Limited correctable acuity to total blindness

# Retinopathy of prematurity (ROP)

## Outcome

Risk factors associated with poor prognosis

- ◆ Posterior location of ROP in Zone I or posterior Zone II
- ◆ Increased severity of stage
- ◆ Circumferential involvement
- ◆ Plus disease

## ◆ Questions for self learning

- ◆ 1. Describe the etiology of ROP
- ◆ 2. List some common risk factors of ROP
- ◆ 3. Which babies need screening for ROP and when
- ◆ 4. Describe the 5 stages of severity ROP
- ◆ 5. What does "Plus Disease" mean
- ◆ 6. What is "Clock Hours" used to describe in terms of ROP
- ◆ 7. What is pre-threshold ROP
- ◆ 8. What is threshold ROP
- ◆ 9. What is the treatment of choice for ROP