


InfantSee Examination



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InfantSEE

- No cost comprehensive eye assessment at 6 to 12 months of age
- www.infantsee.org

Sponsored by
American Optometric Association
and
Johnson & Johnson Vision Care Institute



Recommendations for Eye Exams

- American Optometric Association (AOA)
 - 6 months, 3 years, 5 years
- American Academy of Ophthalmology (AAO)
 - Screen until 20 to 29 years

Differences in Recommendations

- Vision in Preschoolers Study Group. Preschool Vision Screening Tests Administered by Nurse Screeners Compared with Lay Screeners in the Vision in Preschoolers Study. IOVS 2005;46:2639-48.

Difference in Recommendations


- Nurse screeners and lay screeners not significantly different
- Sensitivity of tests (any condition)
 - Autorefraction 61-68%
 - Visual acuity 37-64%
 - Better for single letters than single line
 - Stereoacuity 40-45%

Difference in Recommendations

- American Optometric Association
 - "...the limitations of vision screenings support the need for and value of early detection through a comprehensive eye and vision exam by an eye doctor."
- American Academy of Ophthalmology
 - "...vision screening is effective when properly performed and effective screenings can be done on a cost effective basis."

Vision is Pervasive

- Vision is involved in **everything** we do
- Important to identify and intervene as early as possible to ensure appropriate development



Case History

- Full-term?
- Problems with delivery?
- Birth weight?
- Any developmental delays?
- APGAR
 - One minute
 - Five minutes

APGAR Score

- One, five and ten (if problem) minutes after birth
 - Activity (muscle tone)
 - Pulse
 - Grimace (reflex)
 - Appearance (skin color)
 - Respiration

APGAR Score

- Activity (muscle tone)
 - 0=absent, 1=arms/legs flex, 2=active
- Pulse
 - 0=absent, 1=below 100 bpm, 2=above 100 bpm
- Grimace (reflex)
 - 0=absent, 1=grimace, 2=sneeze, cough, pull away
- Appearance (skin color)
 - 0=blue/pale all over, 1=normal except extremities, 2=normal everywhere
- Respiration
 - 0=blue/pale all over, 1=slow/irregular, 2=good/crying



APGAR Score

- 7-10 is normal
- 4-7 some resuscitative measure may be necessary
- 1-3 emergency resuscitative measure necessary
 - Lower score is at higher risk of eye problems



What Do We Examine?

- How well can you see?
- Do your two eyes work together?
- Do you need glasses?
- Are your eyes healthy?



How Well Can You See?

- Medicolegal reasons
 - Must establish visual acuity prior to manipulating the visual system
- Monitor disease progress/treatment
- Understand level of visual disability

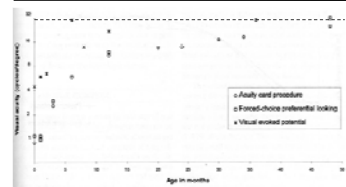


How Well Can You See?

- Use most sophisticated method patient is able to perform
- The following methods of VA are listed from least to most sophisticated



How Well Can You See?



How Well Can You See?



How Well Can You See?

- Fix and Follow
 - Visual ability, not visual acuity
 - "F&F" for fixes and follows
 - "CSM" for central, steady, and maintained
 - Large bright object moved slowly 1-2 feet from patient
- Monocular



How Well Can You See?

- 10 Base Up Test
 - Visual ability, not visual acuity
 - Place 10^A BU in front of one eye
 - Should switch fixation between R and L eyes as you move the target side-to-side
 - If prefers to use one eye only, other eye may have reduced acuity



How Well Can You See?

- Optokinetic Nystagmus
- Resolution acuity
- Present at birth
 - Monocular is immature (poorer nasal to temporal)
 - Mature at 3-6 months
- Motion detection so poor central vision may still respond



How Well Can You See?

- Visual Evoked Potential
 - Resolution acuity
 - Electrical signal from occipital
 - "Sweep" versus "steady state"
 - Sweep used almost exclusively for children because it is much faster
 - Target is checkerboard or sinusoidal gratings
 - Performed only as specialty
 - Expensive, difficult to interpret



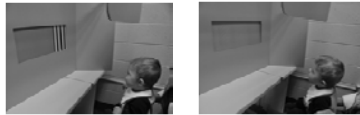
How Well Can You See?



How Well Can You See?



How Well Can You See?



How Well Can You See?

- Teller Visual Acuity
 - Resolution
 - Tester should not know location of stripes
 - Parent holds baby
 - Make noise/fan card to get attention
 - Start with easy to see; flip card to confirm
 - Reinforce with easy to see
 - Test distance = 38, 55, 84 cm
 - Compare to norms chart
 - Not Snellen!
 - Can turn card vertical for astigmatism/nystagmus



How Well Can You See?

- This is not a two-alternative forced choice!
- **Patients do not need to get 4 out of 4 correct to go to next level!!!**



How Well Can You See?

STEREO OPTICAL CO., INC.
TELLER ACUITY CARDS™ 11

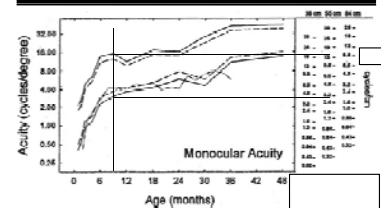
9.80 cycles/cm

Test Distance	Snellen Equivalent	Cycles Per Degree
20cm	20/20	18.80
25cm	20/25	15.00
30cm	20/30	12.00

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Manufactured by Stereo Optical Company, Inc. 2004



How Well Can You See?



How Well Can You See?

Four different types of visual acuity charts are shown: Sloan letters, optometric letters, optometric numbers, and optometric symbols.

How Well Can You See?

- Sjogren Hand Test / Tumbling E / Landolt C
- Resolution acuity
- Hand test is poorer because luminance is different on each side of target (palm is big black area)

Three types of visual acuity charts are shown: Sjogren Hand Test, Tumbling E, and Landolt C.

How Well Can You See?

- Cardiff Cards
- Resolution acuity

Two types of visual acuity charts are shown: Cardiff Cards and resolution acuity.

How Well Can You See?

- American Optical Visual Acuity
- Many POC charts have these symbols
- Unequal blur, luminance, size
- Poor!

A chart showing American Optical Visual Acuity symbols.

How Well Can You See?

- Lea Symbols / HOTV
- Recognition acuity
- Recognition or matching
- logMAR
- Flash cards, full chart (dist and near), crowded symbols, Massachusetts VA test, POC Lea

Four types of visual acuity charts are shown: Lea Symbols, HOTV, and other charts.

Amblyopia Visual Acuity

- Must be standardized
- Same starting place
- Same stopping rule
- Same chart

Amblyopia Visual Acuity: ATS

Table with columns for Patient Name, ID, and Amblyopia Visual Acuity Testing Form. The table contains multiple rows of data for testing different visual acuities.

Do Your Two Eyes Work Together?

Two photographs of children's eyes showing strabismus.

Do Your Two Eyes Work Together?

- What are we looking for?
- Strabismus
- Phoria

Do Your Two Eyes Work Together?

Epidemiology

- 42.5% neonates had strabismus
- 3 months 6.6% premature babies had strabismus
- 12 months 14.8% premature babies had strabismus
- 1.3 to 7.1% of first grade children had strabismus



Do Your Two Eyes Work Together?

When to assess?

- Examination
 - Case history
 - Visual acuity
 - Brief binocular vision
 - Refractive error
 - Ocular health
- Prescribe for significant refractive error
 - Adapt for one month then assess binocular vision thoroughly
- Not while cyclopleged!



Do Your Two Eyes Work Together?

Direct Observation

- Head turn
- Head tilt
- Tipping chin



Do Your Two Eyes Work Together?

Beware of...

- Esotropia appearance
 - Epicanthal folds
 - Narrow interpupillary distance (IPD)
 - Deep set eyes
 - Negative angle kappa
- Exotropia appearance
 - Wide IPD
 - Positive angle kappa



Do Your Two Eyes Work Together?

Hirschberg

- Must be used with kappa test
- Hirschberg should be conducted first
- 33-50 cm from child
- Binocular
- "Blow out the light", puppet, blinking
- Position of light reflex same in binocular and monocular then no strabismus
 - If binocular is different than monocular, then eye with monocular difference is strabismic



Do Your Two Eyes Work Together?

- If central reflex OU monocular, but binocular OD 1 mm temporal then right esotropia
 - 1 mm = 22°



Do Your Two Eyes Work Together?

Krimsky Test

- Prism with appropriate orientation placed in front of fixating eye
- Add prism until corneal reflex of deviating eye is same as angle kappa
- This is the amount of the tropia



Do Your Two Eyes Work Together?

Brückner Test

- To detect the presence of strabismus
- Child fixates direct ophthalmoscope in dark room
- Examiner is ~1 m from child
- **Brighter** eye is strabismic



Do Your Two Eyes Work Together?

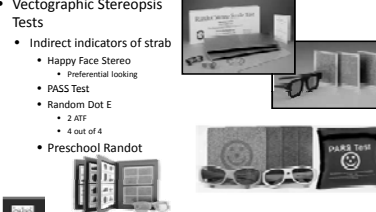
Brückner Test

- False positives
 - Media opacities
 - Posterior pole abnormalities
 - Anisocoria
 - Anisometropia
- Younger than 2 months do not show fundus reflex dimming when fixating
- 25% of children 2-8 months will have fundus reflex differences even though not strabismus
 - Don't use on younger than 8 months



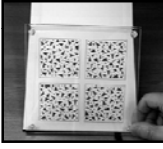
Do Your Two Eyes Work Together?

- Vectographic Stereopsis Tests
 - Indirect indicators of strab
 - Happy Face Stereo
 - Preferential looking
 - PASS Test
 - Random Dot E
 - 2 JIF
 - 4 out of 4
 - Preschool Randot




Do Your Two Eyes Work Together?

- Real Depth Stereopsis Test
 - Frisby stereotest
 - No glasses
 - Child or book cannot move
 - Crossed or uncrossed
 - 340, 170, 55 seconds of arc



Do Your Two Eyes Work Together?

- Prism Stereopsis Test
 - Lang II stereotest
 - No glasses
 - Turn 90 degrees to eliminate disparity
 - 200 (moon), 400 (car), 600 (elephant), or monocular (star) seconds of arc



Do Your Two Eyes Work Together?

- Fusional Vergence
 - 4-10^A BO test
 - 6^A BO over preferred eye while looking at distant target
 - Non-preferred eye *Abducts* then *Adducts*
 - If both phases occur, then fusion
 - If only *Abduct*, then no fusion

Do Your Two Eyes Work Together?

- Cover Test
 - Must be able to see target with **both eyes**
 - Can be performed on any child that can fixate for short period of time
 - Usually older than 1.5 years

Do You Need Glasses?

- Cycloplegic is absolutely necessary
 - First examination, infants and toddlers, suspect latent hyperopia, pseudomyopia

Do You Need Glasses?

- Anesthetic?
 - 0.4% benoxinate
 - 0.5% proparacaine
- Decrease pain of dilating agent
- May improve corneal penetration
- Extra drop ("wash out first drop")

Do You Need Glasses?

- Adrenergic Agonists?
 - 2.5% phenylephrine
 - Hydroxyamphetamine
 - Paremyd
 - 0.25% tropicamide and 1% hydroxyamphetamine
 - Contraindications
 - Cardiovascular problems
 - Younger than 3 years
 - Need cycloplegia

Do You Need Glasses?

- Cholinergic Antagonists?
 - Dilation ≠ cycloplegia
 - Check consistency of retinoscopy reflex
 - More likely to suffer side effects
 - Down syndrome
 - CNS problems
 - Lightly pigmented

Drug	Max	Duration	Comment
Tropicamide	30 min	6 hrs	Not for latent hyperopia
Cyclopentolate	45 min	24 hrs	Not good dilator
Atropine	45 min	1 week	Side effects; ung

Do You Need Glasses?

- Typically
 - 1 gt 0.5% tropicamide
 - 1 gt 0.5% cyclopentolate



Do You Need Glasses?



Do You Need Glasses?



Do You Need Glasses?



Do You Need Glasses?



Reasons to Rx Glasses

- Myopia
- Hyperopia
- Astigmatism
- Anisometropia



Myopia

- Rare in infancy
 - Premature birth, systemic disease
- Amblyopia more than -8.00 D
- Vision loss due to high myopia due to
 - Retinal detachment, macular problems, chorioretinal degeneration, increased spacing between photoreceptors
- Infants' world within 33 cm
 - Don't need to prescribe until over -3.00 D



Hyperopia

	OD	MD
6 mos:	86% at 5-6 D	66% at 5-6 D
2 years	72% at 3-4 D	25% at 3-4 D
4 years:	89% at 3-4 D	42% at 3-4 D



Hyperopia

- BIBS Study
 - Less than 1 year, more than +5.00 D
 - 1 year to 3 years, more than +3.50 D
 - Older than 3 years, more than +2.00 D
 - Complaints
 - Needs



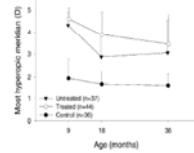
Hyperopia

- Some not prescribe for moderate hyperopia because believe child will emmetropize
 - Children with +2.00 D or more hyperopia not emmetropize



Hyperopia

- Emmetropization not affected by specs (Atkinson, et al. IOVS 2000:3726-31.)



Hyperopia

	OD	MD
Cycloplegic sphere	11.7	10.7
Less than cycloplegic	88.3	89.3



Hyperopia

	OD	MD
%	3.5	0
1/3	3.5	1.9
2/3	15.4	19.2
2/3	23.8	23.1
%	11.9	11.5
Other	41.9	44.2



Astigmatism

- High astigmatism common in infants
 - Most resolves spontaneously
 - If ≥ 3.00 DC, less likely to resolve
 - Consider Rx
 - If ≤ 3.00 DC not require vision correction
 - Check back in 3 months for stability
 - Prescribe for less than ≤ 3.00 DC if affects vision, stable



Astigmatism

	OD	MD
Full astigmatism	22.0	78.5
Less than full	78.0	21.5



Anisometropia

- Considered visually disturbing with difference 1.00 D or greater
- 3% of preschool children have anisometropia
- Examined every 6 months
 - Amblyopia can occur even if child has no symptoms
- Definitely Rx if hyperopia OU



Anisometropia

- Both eyes myopic
 - Amblyopia less likely
 - More myopic eye for near; less myopic eye for distance
- Both eyes hyperopic
 - Amblyopia likely
 - More hyperopic eye rarely used due to accommodative demand
 - Correct immediately



Do You Need Glasses?

- Typically not too upset
- May try to pull glasses off out of curiosity



Fisher-Price Frame

Fisher-Price Frame



Do You Need Glasses?

Are Your Eyes Healthy?

Are Your Eyes Healthy?

- Anterior Segment Assessment
 - Slit lamp
 - Easy for infants
 - Useful for children 3-4 years or more
 - Portable slit lamp (\$4,200 and \$500)
 - For squiggly kids
 - Direct and 20 D

Are Your Eyes Healthy?

- Congenital glaucoma
 - Trauma, uveitis, aphakia (10%)
 - Congenital
 - 65% male; 70% bilateral
 - Tearing, photophobia, cloudy cornea, buphthalmos, megalocornea, Haab's striae
 - Tx: goniotomy, trabeculectomy, shunt
 - Referral for treatment

Are Your Eyes Healthy?

- Nasolacrimal Duct Obstruction (NDO)
 - Failure of nasolacrimal duct to open to nose
 - Epiphora, recurrent conjunctivitis, skin rash
 - Most cases resolve spontaneously
 - 3 months; 80% by 12 months
 - 6 months; 72% by 12 months
 - 9 months; 52% by 12 months

Are Your Eyes Healthy?

- Treatment for NDO
 - Ask OMD when they want to see NDO patients
 - Before or after one year
 - Nasolacrimal massage
 - Index finger on medial palpebral ligament (nodule) with fingernail on lid
 - Press nodule then press in toward eye firmly 5 X per day
 - Prophylactic antibiotics
 - Nasolacrimal duct probing
 - 95% success
 - May insert silicone tubes for 4-6 months

Are Your Eyes Healthy?

- Leukocoria
 - Congenital cataract
 - Coats disease
 - Retinoblastoma
 - Retinal detachment
 - Retinopathy of Prematurity
 - PHPV
 - Posterior uveitis
 - Toxocariasis

Are Your Eyes Healthy?


- Congenital Esotropia
 - Approximately 1/3 of all ET
 - Approximately 1% of general population
 - Typical onset 6 months
 - Large-angle, constant, unilateral esotropia
 - Amblyopia

Are Your Eyes Healthy?

- Hemangioma
 - Present at birth or within months
 - Reddish, purple raised lesion
 - More common female, white
 - Capillary
 - Red, superficial
 - Cavernous
 - Purple, deeper
 - Treatment
 - Often involute on own (4 years)
 - Steroid injections or po
 - Laser


Are Your Eyes Healthy?

- Congenital Cataracts
 - 1.2 to 6 cases per 10,000 births
 - 1/2 to 1/3 bilateral
 - Treatment is excision
 - Optimal time ~6 weeks to 3 months
 - Spectacles
 - Contact lens
 - IOL implant



Are Your Eyes Healthy?

- Unilateral ≥ 3 mm central opacity
- 28 to 210 days at surgery
- PHPV allowed if not affect ciliary body, retina, optic nerve
- Corneal diameter ≥ 9 mm
- ≥ 36 weeks gestation
- No problems that might affect VA



Are Your Eyes Healthy?

- Surgery (n = 57)
 - 8.00 D undercorrection if 4-6 weeks
 - 6.00 D undercorrection if >6 weeks
 - After 1 month, Rx spectacles if more than +1.00 DS, -3.00 DS, or 1.50 DC
 - 2.00 D overcorrection
- Contact lens (n = 57)
 - Silsoft or GP w/in 1 week of surgery
 - 2.00 D overcorrection

Are Your Eyes Healthy?

- Patch 2 weeks post-op
 - 1 hour per day for each month of age until 8 months
 - All waking hours every other day or 1/2 waking hours every day

Are Your Eyes Healthy?

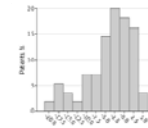
	Treatment, No. (%)		Control, No. (%)	
	CL (n = 57)	CL (n = 57)	CL (n = 57)	CL (n = 57)
Visual Acuity				
20/20 or better	13 (23)	4 (7)	13 (23)	4 (7)
20/30 or better	19 (33)	11 (19)	19 (33)	11 (19)
20/40 or better	28 (49)	27 (48)	28 (49)	27 (48)
20/50 or better	30 (53)	28 (49)	30 (53)	28 (49)
20/60 or better	32 (56)	30 (53)	32 (56)	30 (53)
20/70 or better	33 (58)	31 (54)	33 (58)	31 (54)
20/80 or better	34 (60)	32 (56)	34 (60)	32 (56)
20/90 or better	35 (61)	33 (58)	35 (61)	33 (58)
20/100 or better	36 (63)	34 (60)	36 (63)	34 (60)
20/120 or better	37 (65)	35 (61)	37 (65)	35 (61)
20/150 or better	38 (67)	36 (63)	38 (67)	36 (63)
20/200 or better	39 (68)	37 (65)	39 (68)	37 (65)
20/250 or better	40 (70)	38 (67)	40 (70)	38 (67)
20/300 or better	41 (72)	39 (68)	41 (72)	39 (68)
20/400 or better	42 (74)	40 (70)	42 (74)	40 (70)
20/500 or better	43 (75)	41 (72)	43 (75)	41 (72)
20/600 or better	44 (77)	42 (74)	44 (77)	42 (74)
20/750 or better	45 (79)	43 (75)	45 (79)	43 (75)
20/900 or better	46 (81)	44 (77)	46 (81)	44 (77)
20/1100 or better	47 (83)	45 (79)	47 (83)	45 (79)
20/1400 or better	48 (84)	46 (81)	48 (84)	46 (81)
20/1800 or better	49 (86)	47 (83)	49 (86)	47 (83)
20/2400 or better	50 (88)	48 (84)	50 (88)	48 (84)
20/3000 or better	51 (90)	49 (86)	51 (90)	49 (86)
20/4000 or better	52 (91)	50 (88)	52 (91)	50 (88)
20/5000 or better	53 (93)	51 (90)	53 (93)	51 (90)
20/6000 or better	54 (95)	52 (91)	54 (95)	52 (91)
20/8000 or better	55 (97)	53 (93)	55 (97)	53 (93)
20/10000 or better	56 (98)	54 (95)	56 (98)	54 (95)
20/15000 or better	57 (100)	55 (97)	57 (100)	55 (97)

p < 0.001

Are Your Eyes Healthy?


	Treatment, No. (%)	
	CL (n = 57)	CL (n = 57)
Visual Acuity		
20/20 or better	13 (23)	4 (7)
20/30 or better	19 (33)	11 (19)
20/40 or better	28 (49)	27 (48)
20/50 or better	30 (53)	28 (49)
20/60 or better	32 (56)	30 (53)
20/70 or better	33 (58)	31 (54)
20/80 or better	34 (60)	32 (56)
20/90 or better	35 (61)	33 (58)
20/100 or better	36 (63)	34 (60)
20/120 or better	37 (65)	35 (61)
20/150 or better	38 (67)	36 (63)
20/200 or better	39 (68)	37 (65)
20/250 or better	40 (70)	38 (67)
20/300 or better	41 (72)	39 (68)
20/400 or better	42 (74)	40 (70)
20/500 or better	43 (75)	41 (72)
20/600 or better	44 (77)	42 (74)
20/750 or better	45 (79)	43 (75)
20/900 or better	46 (81)	44 (77)
20/1100 or better	47 (83)	45 (79)
20/1400 or better	48 (84)	46 (81)
20/1800 or better	49 (86)	47 (83)
20/2400 or better	50 (88)	48 (84)
20/3000 or better	51 (90)	49 (86)
20/4000 or better	52 (91)	50 (88)
20/5000 or better	53 (93)	51 (90)
20/6000 or better	54 (95)	52 (91)
20/8000 or better	55 (97)	53 (93)
20/10000 or better	56 (98)	54 (95)
20/15000 or better	57 (100)	55 (97)

p = 0.54



Are Your Eyes Healthy?

- 20 / 114 (18%)
 - Glaucoma
 - 9 / 57 (16%) with CL
 - 11 / 57 (19%) with IOL
 - Glaucoma suspect
 - 11 / 57 (19%) with CL
 - 5 / 57 (9%) with IOL
 - Total
 - p = 0.55



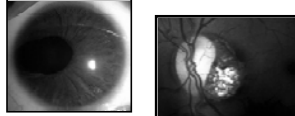
Are Your Eyes Healthy?

	IOL	CL
Total patient costs	\$840,875	\$611,407
Mean Medicaid cost	\$14,752	\$10,726
Maximum patient cost	\$50,473	\$27,506
Minimum patient cost	\$9,412	\$8,805

Carrigan AK, et al. Ophthalmol 2013;120:14-9

Are Your Eyes Healthy?

- Coloboma
 - Incomplete closure of fetal fissure
 - Symptoms vary widely



Are Your Eyes Healthy?

- Posterior Segment Assessment
 - Binocular indirect ophthalmoscope
 - Monocular indirect ophthalmoscope
 - Direct ophthalmoscope
- During sleep, anesthesia, lunch



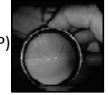
Are Your Eyes Healthy?

- Retinal heme
 - Younger than 2 years
 - 60% abused had retinal heme vs 10% accidental
 - Bilateral in 40% abused vs 2% accidental
 - May be pathognomonic for abuse
 - Consider hemes caused by birth (resolve within one month), falls, accidents



Are Your Eyes Healthy?

- Retinopathy of Prematurity (ROP)
 - Risk factors
 - Birth < 36 weeks gestation
 - Birthweight <1500 g (3 lb 5 oz), especially <1250 g (2 lb 12 oz)
 - Supplemental oxygen therapy
 - Supplemental oxygen so peripheral vessels don't develop
 - Supplemental oxygen reduced so neovascularization occurs



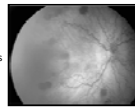
Are Your Eyes Healthy?

- Signs of ROP
 - Avascular peripheral retina
 - Dilated, tortuous retinal vessels ("plus")
 - Poor dilation
 - Engorged iris vessels
 - Typically bilateral
 - Neovascularization, hemorrhage, RD, leukocoria

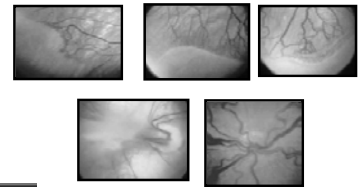


Are Your Eyes Healthy?

- ▶ Location
 - Zone 1 – disc to twice distance from disc to macula
 - Zone 2 – to ora serrata
 - Zone 3 – beyond ora serrata
- ▶ Extent
 - Clock hours
- ▶ Severity
 - Stage 1 – Demarcation line
 - Stage 2 – Line with ridge
 - Stage 3 – Line with ridge extending in vitreous
 - Stage 4 – Partial retinal detachment
 - Stage 5 – Total retinal detachment
- ▶ Plus Disease
 - Dilated, tortuous blood vessels

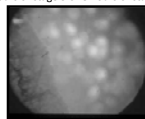


Are Your Eyes Healthy?



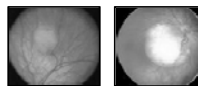
Are Your Eyes Healthy?

- Onset 32-42 weeks after conception
- If less than 2 lb 12 oz, follow q 2 week until 14 weeks, q 1 month until 6 months, q 6 months
- Refer for laser or cryo (III), scleral buckle (IV), or vitrectomy (V)
 - Peripheral ablation if 5 contiguous hours of stage 3 or 8 hours of stage 3 (both with plus disease)



Are Your Eyes Healthy?

- Retinoblastoma
 - 1 in 20,000 births
 - Most common intraocular malignancy in children
 - May present with white pupil or strabismus
 - Mean age at diagnosis = 18 months, almost all before 4 years
 - Begin as gray elevation and proceed to whitish elevation with telangiectasia
 - High calcium content so very reflective on b-scan
 - Survival rates >90%
 - 30% bilateral



Are Your Eyes Healthy?

- Treatment for Retinoblastoma
 - Enucleation
 - Radiation
 - Cryotherapy
 - Photocoagulation
 - Chemotherapy

