HOW AND WHY TO CLASSIFY:

AMD / CATARACTS / DM RET / GLAUCOMA

THE ORLANDO VAMC
LAKE NONA / LAKE BALDWIN

KNOW YOUR POPULATION

TABLE IV. Frequency of Nonrefractive Ocular Diagnoses

Diagnosis	Frequency	Percent
Glaucoma	168	25.5
Suspect	133	20.2
Primary Open Angle	27	4.1
Angle Closure	4	0.6
Pseudoexfoliation	1	0.2
Traumatic	3	0.5
Diabetes	91	13.8
No Retinopathy	68	10.3
Nonproliferative	16	2.4
Macular Edema	2	0.3
Proliferative	5	0.8
AMD	31	4.7
Nonexudative	21	3.2
Drusen	8	1.2
Exudative	2	0.3
Other	139	21
Blepharitis	43	6.5
Cataract	39	5.9
Retinal Vascular Disease	22	3.3
Severe Dry Eye	14	2.1
Optic Neuropathy	11	1.7
Peripheral Retinal Disease (Lattice, Retinal Break, Detachment)	10	1.5

VETERAN EYE DISEASE AFTER ELIGIBILITY REFORM: PREVALENCE AND CHARACTERISTICS

(ATLANTA)

Military Medicine, 178, 7:811, 2013

TABLE 2. Ocular Diagnoses in Veterans in the Veterans Affairs Capitol Health Care Network from Fiscal Year 2007 to Fiscal Year 2011

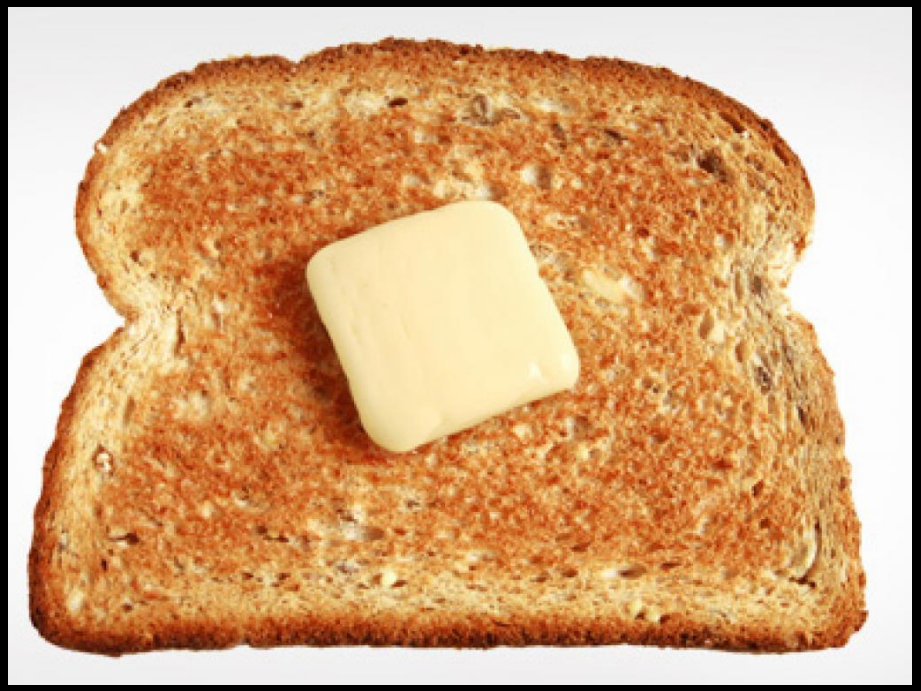
	Fiscal Year						
Variable	2007 (N = 130,709)	2007 (N = 130,709)	2007 (N = 130,709)	2007 (N = 130,709)	2007 (N = 130,709)	β	*P* Value
Disease category, n (%)							
Disorders of refraction and accommodation	11,067 (8.5)	12,046 (9.2)	14,150 (10.3)	16,078 (11.4)	18,854 (13.1)	1.13	<.01
Glaucoma	8815 (6.7)	9003 (6.9)	9494 (6.9)	9921 (7.0)	10,431 (7.4)	0.14	.03
Ophthalmic complications of diabetes	2896 (2.2)	3180 (2.4)	3065 (2.2)	2952 (2.1)	2908 (2.0)	−0.07	.148
Cataract	9215 (7.1)	8827 (6.7)	11,292 (8.2)	12,050 (8.5)	13,529 (9.6)	0.68	.02
Any ophthalmic diagnosis	26,804 (20.5)	27,552 (21.1)	29,677 (21.5)	31,460 (22.2)	33,611 (23.3)	0.67	<.01

TRENDS IN PREVALENCE OF DIAGNOSED OCULAR DISEASE AND UTILIZATION OF EYE CARE SERVICES IN AMERICAN VETERANS

(MD, DC, AND PARTS OF VA, WV, PA)

Am J Ophthalmol. 2017 Jan;173:70-75

WHY THESE DISORDERS?



Flatiron, Midtown East, NY, NY

IS IT ENOUGH TO JUST SAY…

THE PATIENT HAS…

"MACULAR DEGENERATION"

"CATARACTS"

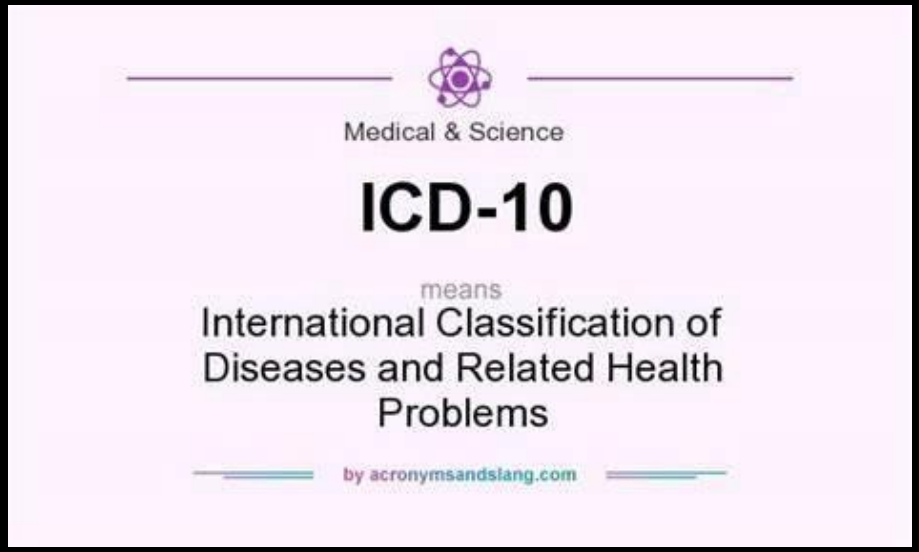
"DIABETIC RETINOPATHY"

"GLAUCOMA"

MAYBE…BUT

ICD-10 WAGS THE DOG

WHAT IS ICD-10?



10TH REVISION
FIRST USED WORLDWIDE 1994
USA STARTED USING 2015

- The global standard for health data, clinical documentation, and statistical aggregation
- Multiple uses, including primary care
- Scientifically up-to-date
- Designed for use in a digital world
- State-of-the-art technology reduces the costs of training and implementation
- Multilingual design facilitates global use
- Proposal platform allows stakeholder participation in keeping ICD–11 up-to-date.
- 17,000 categories, 80,000 concepts, 120,000 terms, >1.6 million clinical terms interpreted

- EXAMPLES OF RARE CODES
  - STRUCK BY COW, INITIAL
  - BURN DUE TO WATER-SKIS ON FIRE, INITIAL

- ICD-11 EXPECTED 1/01/22
  - WHEN WILL USA ADOPT IT?

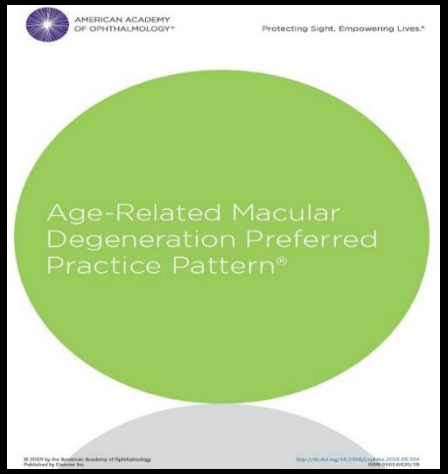
AGE-RELATED MACULAR DEGENERATION (AMD)

"…a disorder of the macula characterized by one or more of the following:

Presence of at least intermediate-size drusen (>63 μm in diameter),

Retinal pigment epithelium (RPE) abnormalities such as hypopigmentation or hyperpigmentation, Presence of any of the following features:

geographic atrophy of the RPE, choroidal neovascularization (CNV: exudative, wet), polypoidal choroidal vasculopathy (PCV), reticular pseudodrusen, or retinal angiomatous proliferation"

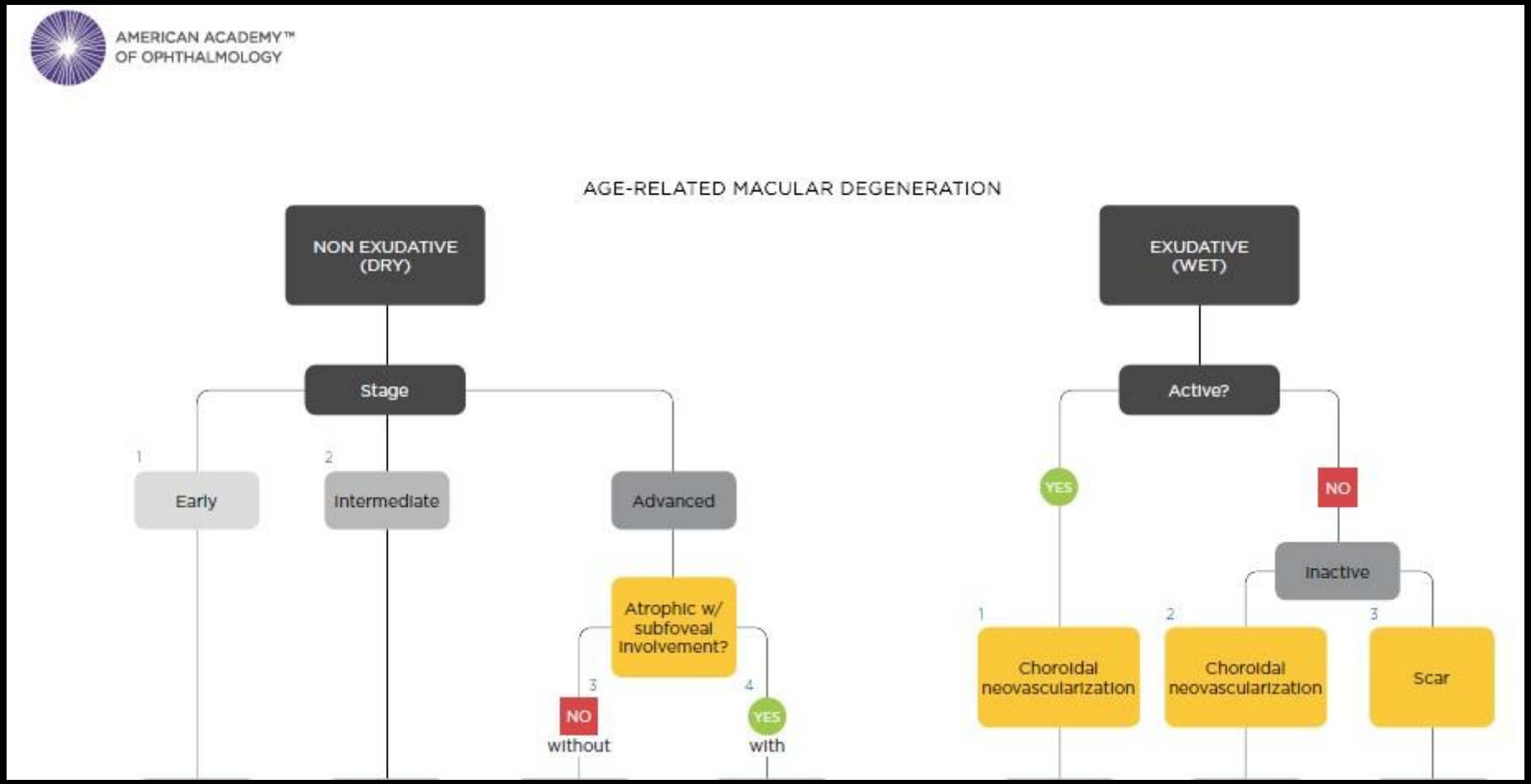


AAO PPP 2022

AMD
RISK FACTORS

- MAIN
  - AGE
  - ETHNICITY
    - CAUCASIAN, FAMILY HISTORY
- CONSISTENTLY IDENTIFIED
  - SMOKING
    - DOSE DEPENDENT
      - RECOMMEND STOPPING
    - PASSIVE (2ND HAND) INCREASES RISK
  - LOW LEVELS OF ANTIOXIDANTS
    - VITAMIN C, E
    - CAROTENOIDS (LUTEIN, ZEAXANTHIN)
    - ZINC
- ADDITIONAL RISK FACTORS
  - DIET HIGHER IN
    - SATURATED FAT, CHOLESTEROL
  - HIGHER BMI
  - INCREASED MALE WAIST/HIP RATIO
- CONFLICTING RESULTS
  - ASPIRIN
    - PTS SHOULD CONTINUE TO USE THIS
  - GENETICS
    - COMPLEMENT FACTOR H (CFH)
      - GENETIC TESTING NOT RECOMMENDED
  - HYPERTENSION
  - CARDIOVASCULAR DISEASE
- INCONCLUSIVE
  - HORMONAL STATUS
  - SUNLIGHT EXPOSURE
  - ALCOHOL USE
  - VITAMIN B AND D STATUS
- OTHER CONSIDERATIONS
  - C-REACTIVE PROTEIN
    - INFLAMMATORY MARKER FOR PROGRESSION

AMD SUB-TYPES



FROM AAO: ARMD DECISIONTREE-ICD10.2017

HOW TO CLASSIFY AMD…

- Nonexudative Age-Related Macular Degeneration
  - Nonexudative age-related macular degeneration, bilateral
    - Nonexudative age-related macular degeneration, bilateral, advanced atrophic with subfoveal involvement
    - Nonexudative age-related macular degeneration, bilateral, advanced atrophic without subfoveal involvement
    - Nonexudative age-related macular degeneration, bilateral, early dry stage
    - Nonexudative age-related macular degeneration, bilateral, intermediate dry stage
    - Nonexudative age-related macular degeneration, bilateral, stage unspecified
  - Nonexudative age-related macular degeneration, left eye
    - Nonexudative age-related macular degeneration, left eye, advanced atrophic with subfoveal involvement
    - Nonexudative age-related macular degeneration, left eye, advanced atrophic without subfoveal involvement
    - Nonexudative age-related macular degeneration, left eye, early dry stage
    - Nonexudative age-related macular degeneration, left eye, intermediate dry stage
    - Nonexudative age-related macular degeneration, left eye, stage unspecified
  - Nonexudative age-related macular degeneration, right eye
    - Nonexudative age-related macular degeneration, right eye, advanced atrophic with subfoveal involvement
    - Nonexudative age-related macular degeneration, right eye, advanced atrophic without subfoveal involvement
    - Nonexudative age-related macular degeneration, right eye, early dry stage
    - Nonexudative age-related macular degeneration, right eye, intermediate dry stage
    - Nonexudative age-related macular degeneration, right eye, stage unspecified
  - Nonexudative age-related macular degeneration, unspecified eye
    - Nonexudative age-related macular degeneration, unspecified eye, advanced atrophic with subfoveal involvement
    - Nonexudative age-related macular degeneration, unspecified eye, advanced atrophic without subfoveal involvement
    - Nonexudative age-related macular degeneration, unspecified eye, early dry stage
    - Nonexudative age-related macular degeneration, unspecified eye, intermediate dry stage
    - Nonexudative age-related macular degeneration, unspecified eye, stage unspecified

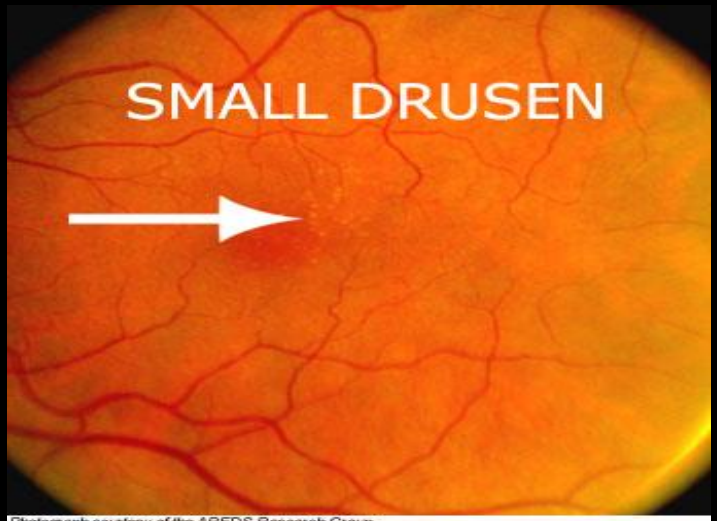
- Exudative Age-Related Macular Degeneration
  - Exudative age-related macular degeneration, bilateral
    - Exudative age-related macular degeneration, bilateral, stage unspecified
    - Exudative age-related macular degeneration, bilateral, with active choroidal neovascularization
    - Exudative age-related macular degeneration, bilateral, with inactive choroidal neovascularization
    - Exudative age-related macular degeneration, bilateral, with inactive scar
  - Exudative age-related macular degeneration, left eye
    - Exudative age-related macular degeneration, left eye, stage unspecified
    - Exudative age-related macular degeneration, left eye, with active choroidal neovascularization
    - Exudative age-related macular degeneration, left eye, with inactive choroidal neovascularization
    - Exudative age-related macular degeneration, left eye, with inactive scar
  - Exudative age-related macular degeneration, right eye
    - Exudative age-related macular degeneration, right eye, stage unspecified
    - Exudative age-related macular degeneration, right eye, with active choroidal neovascularization
    - Exudative age-related macular degeneration, right eye, with inactive choroidal neovascularization
    - Exudative age-related macular degeneration, right eye, with inactive scar
  - Exudative age-related macular degeneration, unspecified eye
    - Exudative age-related macular degeneration, unspecified eye, stage unspecified
    - Exudative age-related macular degeneration, unspecified eye, with active choroidal neovascularization
    - Exudative age-related macular degeneration, unspecified eye, with inactive choroidal neovascularization
    - Exudative age-related macular degeneration, unspecified eye, with inactive scar

EARLY NONEXUDATIVE AMD (AREDS 2)

- SIGNS
  - MULTIPLE SMALL DRUSEN
    - < 63 um IN DIAMETER
  - FEW MEDIUM DRUSEN
    - 63-124 um IN DIAMETER
      - (≥ 125 um = WIDTH OF VEIN AT DISC MARGIN)

  AND / OR
  - RPE ABNORMALITIES

- PROGRESSION
  - NO OR SMALL DRUSEN
    - 15% DEVELOP LARGE DRUSEN IN 10 YRS
  - MEDIUM DRUSEN
    - ONE EYE
      - 37% DEVELOPED LARGE DRUSEN
    - BOTH EYES
      - 71% DEVELOPED LARGE DRUSEN
    - 14% DEVELOP ADVANCED AMD IN 10YRS

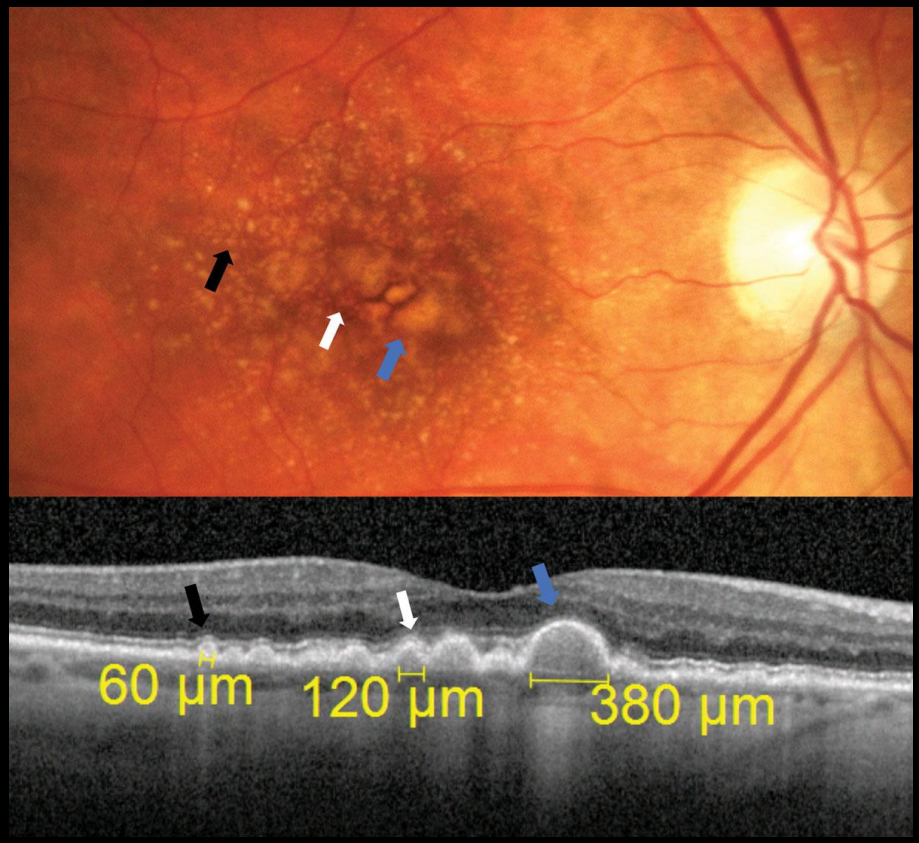


Photograph courtesy of the AREDS Research Group

INTERMEDIATE NONEXUDATIVE AMD (AREDS 3)

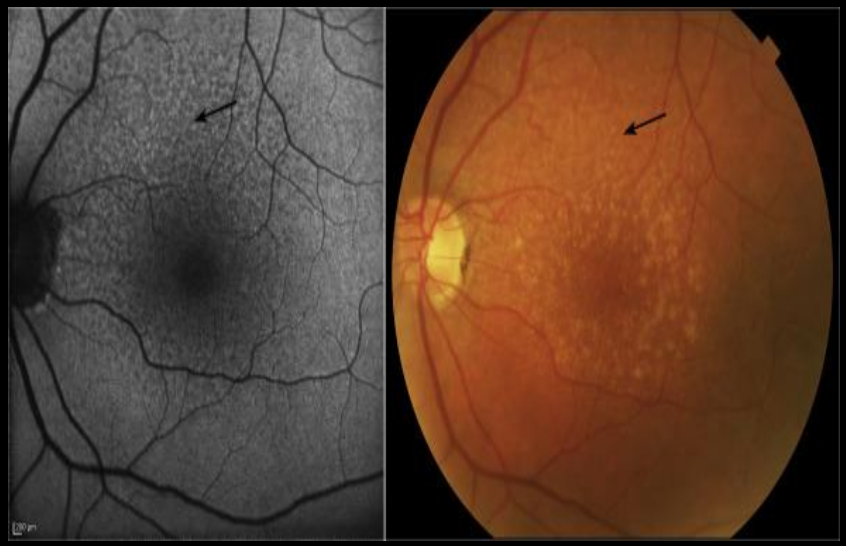
- SIGNS
  - EXTENSIVE MEDIUM DRUSEN 63-124 um IN DIAMETER

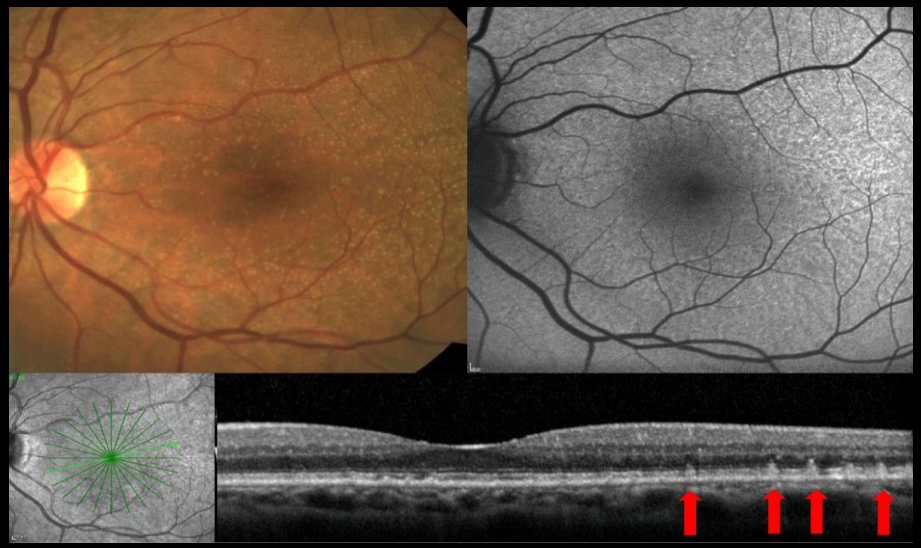
  OR
  - ONE OR MORE LARGE DRUSEN (≥ 125 um = WIDTH OF VEIN AT DISC MARGIN)
  - RETICULAR PSEUDODRUSEN
    - = SUBRETINAL DRUSENOID DEPOSITS
- PROGRESSION
  - 18% RISK OF PROGRESSING TO ADVANCED AMD IN 5YRS
- RISK ASSESSMENT
  - ONE EYE WITH LARGE DRUSEN
    - 6.3% RISK OF PROGRESSION TO ADVANCED AMD IN 5 YEARS
  - BOTH EYES, MULTIPLE LARGE DRUSEN
    - 26% RISK OF PROGRESSION TO ADVANCED AMD IN 5 YEARS

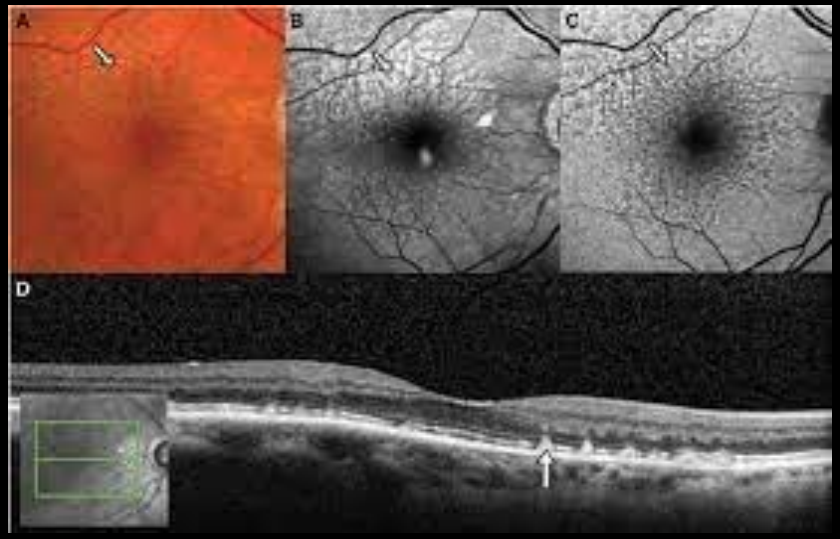


RETICULAR PSEUDODRUSEN

- APPEARANCE
  - SMALL HYPERREFLECTIVE DEPOSITS ON TOP OF RPE
  - CONE SHAPED
- ASSOCIATION
  - INCREASED RISK OF
    - CNVM
    - ADVANCED NONEXUDATIVE AMD (GEOGRAPHIC ATROPHY)
  - POSSIBLY POORER VISUAL FUNCTION

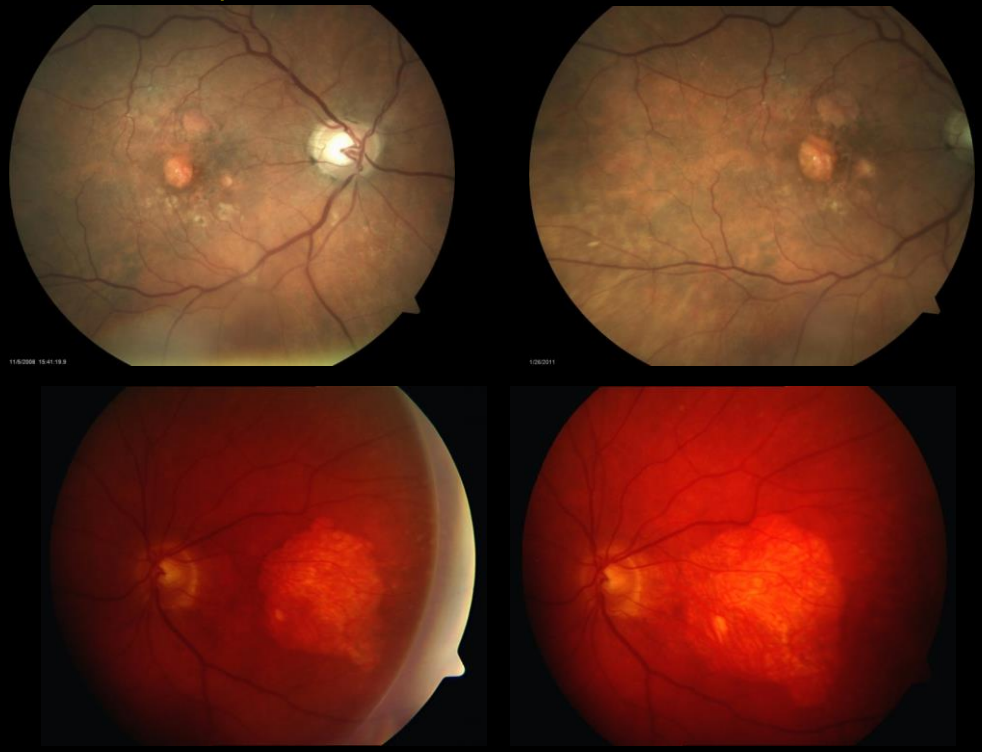


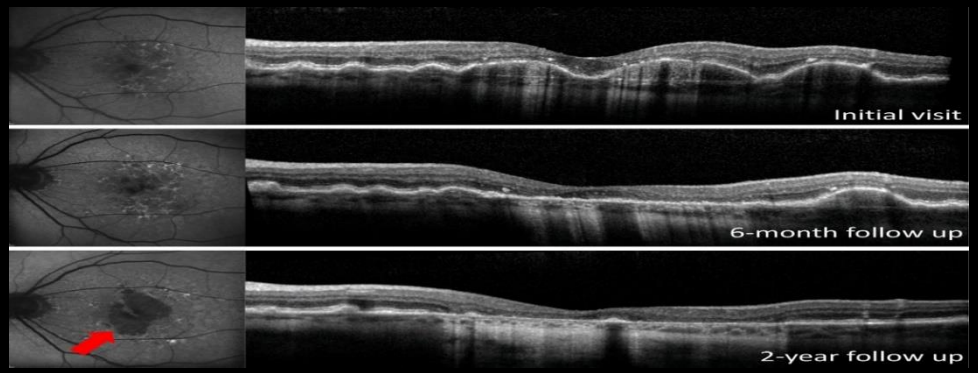




ADVANCED NONEXUDATIVE AMD

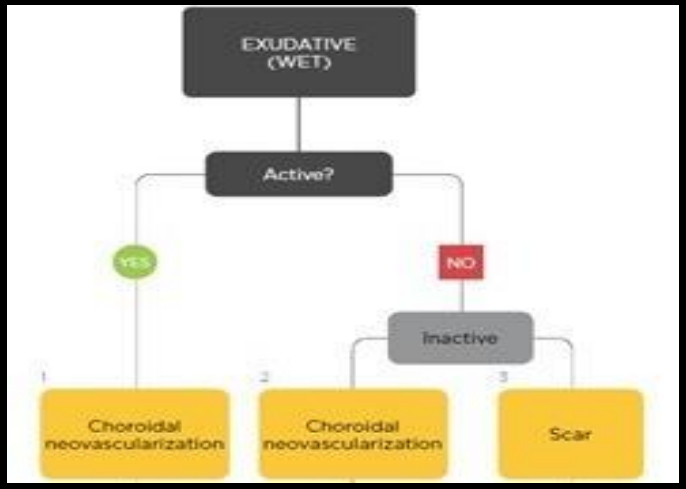
- TYPES
  - ATROPHIC NONSUBFOVEAL
  - ATROPHIC SUBFOVEAL
  - BOTH ARE GEOGRAPHIC ATROPHY
    - BUT THERE'S NO CODE FOR THAT
- SIGNS
  - WELL-DEMARCATED RPE AND / OR CHORIOCAPILLARIS ATROPHY
  - DRUSEN AND RPE CHANGES POSSIBLE
- PROGRESSION
  - 50% HAVE DOUBLING OF VISUAL ANGLE OVER 2 YEARS
  - BEAVER DAM
    - 22% DEVELOPED ADVANCED IN OTHER EYE OVER 5 YEARS
  - AREDS
    - 35-50% DEVELOPED ADVANCED IN OTHER EYE OVER 5 YEARS
  - CNVM MAY STILL OCCUR

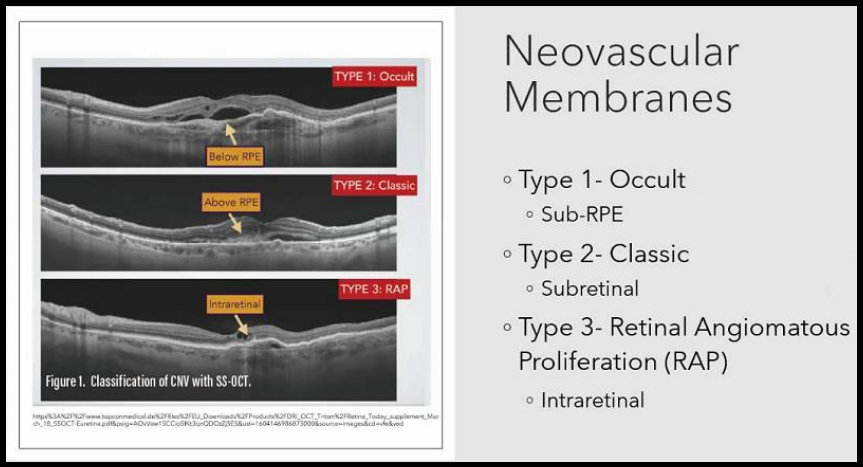




EXUDATIVE AMD SUB-TYPES

- EXUDATIVE ACTIVE
  - **NEW OR ACTIVELY BEING TREATED**
  - CNVM TYPES
    - OCCULT (TYPE 1)
      - CNVM BELOW RPE
      - FIBROVASCULAR PED
      - LATE LEAKAGE OF UNDETERMINDED SOURCE
    - CLASSIC (TYPE 2)
      - CNVM THROUGH / ABOVE RPE IN THE SUBRETINAL SPACE
      - TYPES:
        - » PREDOMINANTLY CLASSIC
        - » MINIMALLY CLASSIC
    - MIXED LESIONS
  - OTHER SUBTYPES / FEATURES
    - RETINAL PED
    - IDIOPATHIC POLYPOIDAL CHOROIDAL VASCULOPATHY (SUBTYPE 1)
    - RETINAL ANGIOMATOUS PROLIFERATION (RAP = TYPE 3), GROWS FROM RETINA TO SUBRETINA SPACE = POSTERIORLY
- EXUDATIVE INACTIVE
  - **ESTABLISHED / NOT BEING TREATED**
  - CNVM
    - STABLE
  - SCAR





CNVM

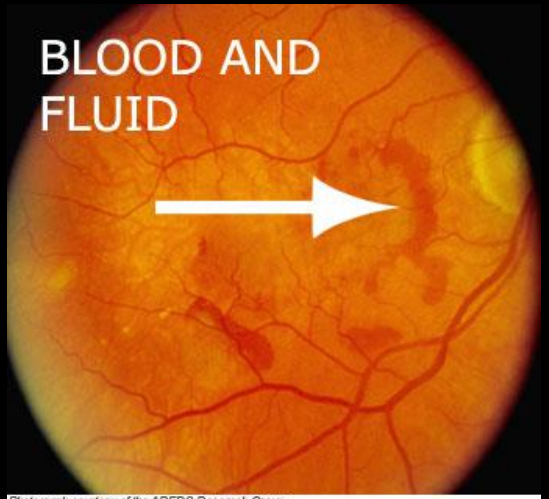
- WHAT IS IT?
  - PATHOLOGIC ANGIOGENESIS ORIGINATING FROM THE CHOROIDAL VASCULATURE THAT EXTENDS THROUGH A DEFECT IN BRUCH'S MEMBRANE TO THE NEUROSENSORY RETINA
- WHAT CAUSES IT?
  - MULTIFACTORIAL
  - ALTERATIONS IN BRUCH'S MEMBRANE
  - MIGRATION OF MACROPHAGES
  - PRODUCTION OF VASCULAR ENDOTHELIUM GROWTH FACTOR (VEGF)

- CAUSES OF CNVM
  - AMD
  - MYOPIC DEGENERATION
  - POHS
  - ANGIOID STREAKS
  - CHOROIDAL RUPTURE
  - PRIOR RETINAL LASER
  - CHRONIC CSC
  - MAC TEL 2
  - WHITE DOT SYNDROMES
  - UVEITIS
  - CHOROIDAL TUMORS
  - ETC.
  - IDIOPATHIC

EXUDATIVE AMD ACTIVE

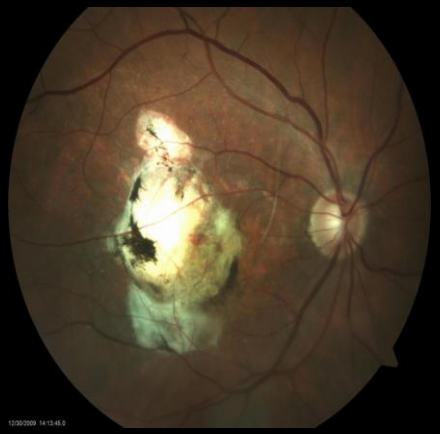
- SIGNS
  - ACTIVE CNVM
    - SEROUS (FLUID) AND / OR HEMORRHAGIC (BLOOD) DETACHMENT OF
      - NEUROSENSORY RETINA

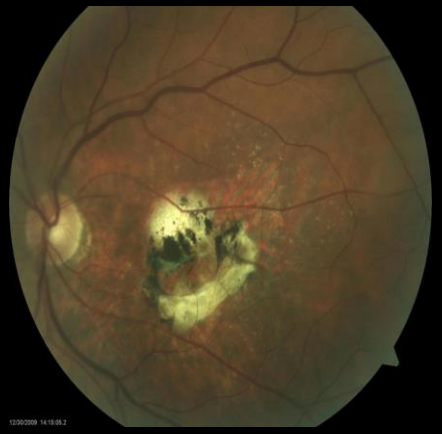
      OR
      - RPE
    - RETINAL HARD EXUDATES
- SIGNS OF PROGRESSION
  - CLINICALLY
    - NEW HEMORRHAGE
    - NEW SUBRETINAL FLUID
    - NEW EXUDATE
  - OCT
    - INCREASED THICKENING / FLUID ON OCT MACULA CENTRAL SCAN OR CUTS

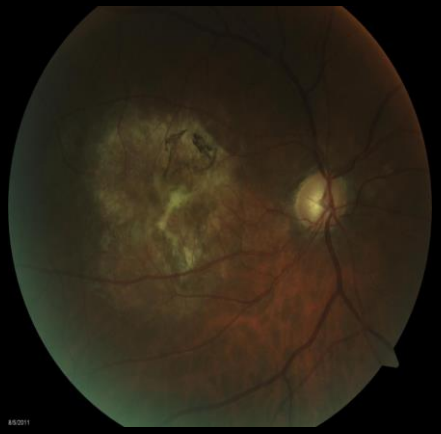


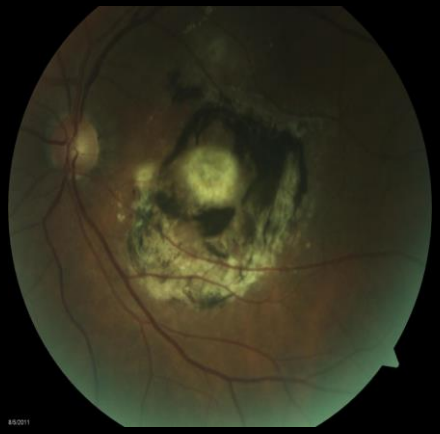
EXUDATIVE AMD INACTIVE

- SIGNS
  - INACTIVE
    - H/O CNVM
      - MONITORED ONLY, NO CURRENT TX
    - SCAR
      - SUBRETINAL FIBROVASCULAR TISSUE
      - MORE FIBROUS WITHIN A FEW YRS
      - END RESULT OF CNVM
        - » CNVM WITHOUT TREATMENT
        - » CNVM WITH TREATMENT
      - MOST OFTEN LEGALLY BLIND IF OU
- SIGNS OF PROGRESSION
  - CLINICALLY
    - NEW / RECURRENT HEMORRHAGE (CNVM)
    - ENLARGEMENT OF SCAR
  - FAF
    - ENLARGEMENT OF HYPOAUTOFLUORESCENCE (BLACK AREAS)







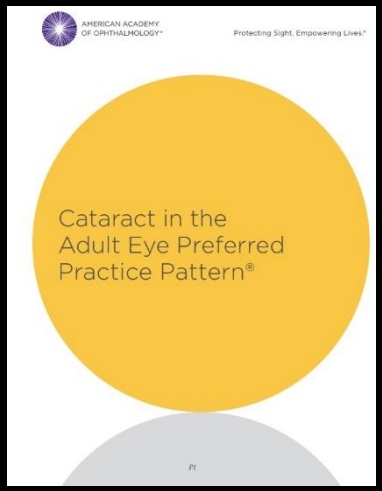


NEED TO KNOW

- CLINICAL SIGNS
  - NONEXUDATIVE
  - EXUDATIVE
- TESTING REQUIRED
  - VA, AMSLER
  - OCT, FAF IMAGES, FA, OCTA
- STAGES OF AMD / FOLLOW-UP
  - NONEXUDATIVE
    - EARLY
      - YEARLY, PHOTOS / FAF / OCT?
    - INTERMEDIATE
      - 6 MOS, PHOTOS ? / FAF ? / OCT
    - ADVANCED
      - 6 MOS / YEARLY, PHOTOS / FAF / OCT
  - ALL STAGES, LOOK FOR / DOCUMENT
    - + / - HEME / SRF / EXUDATE
  - EXUDATIVE
    - ACTIVE – TO RETINA
    - INACTIVE – RETINA MONITORS THEN OD
    - SCAR – RETINA MAY RETURN TO OD
- PATIENT EDUCATION
  - REVIEWED AMD
  - NO / STOP SMOKING
  - INCREASE FRUIT / VEGETABLES
    - SPECIFICALLY GREEN LEAFY VEGETABLES
  - TAKE OTC MULTIVITAMIN
    - AREDS 2 VITAMIN
      - IF INTERMEDIATE / ADVANCED / MONOCULAR)
  - HOME AMSLER QD, RTC STAT IF CHANGES
- TREATMENT
  - AREDS 2 VITAMINS / MINERALS
  - CURRENTLY
    - INTRAVITREAL INJECTIONS FOR CNVM
      - ANTI-VEGF
        - » AVASTIN, LUCENTIS, EYELEA, BEOVU, VABYSMO (UP TO 4 MOS)
      - STEROIDS
    - COMPLEMENT C3 INHIBITOR FOR GA
      - SYFOVRE
  - HISTORICALLY AND STILL USED PRN
    - FOCAL LASER
    - PDT

CATARACT

"…a degradation of the optical quality of the crystalline lens that affects vision. Most cataract development is related to aging, and it can occur in one or both eyes."



AAO PPP 2021

CATARACT RISK FACTORS

TABLE 1 FACTORS ASSOCIATED WITH INCREASED RISK OF CATARACT DEVELOPMENT*

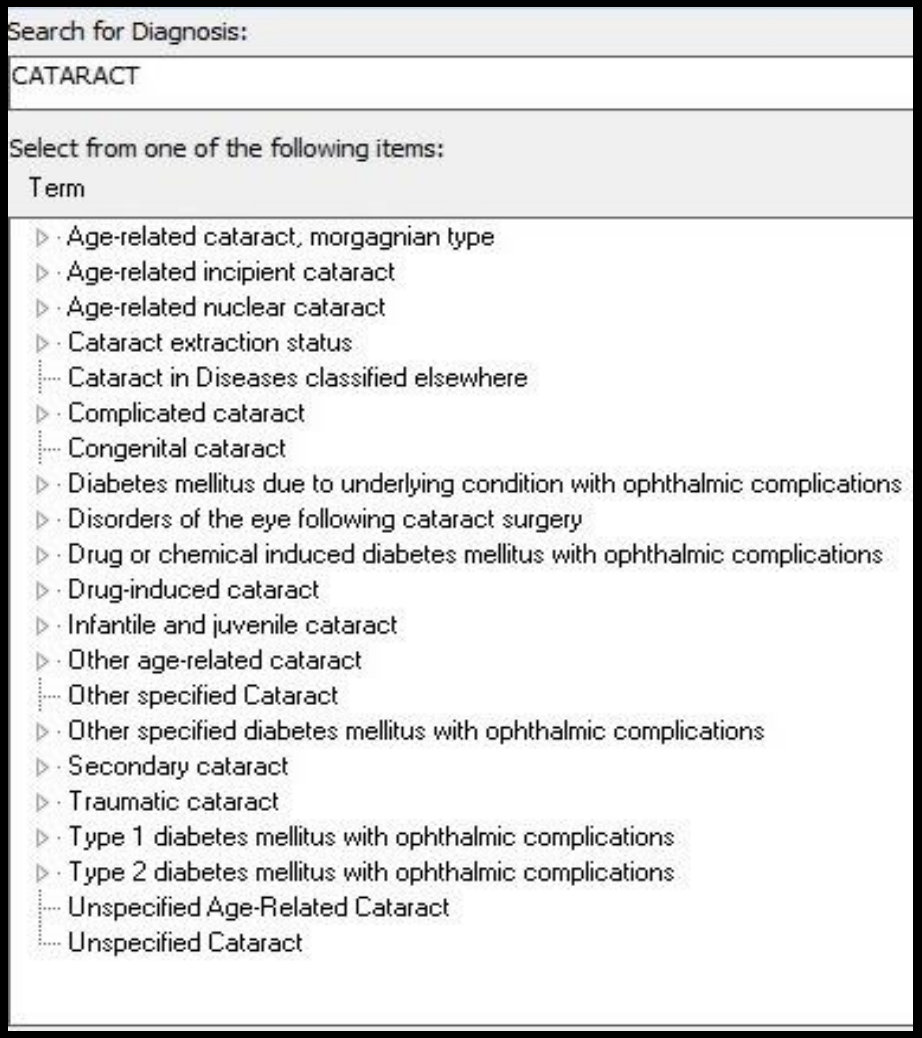
Cataract Type	Associated Risk Factors
Cortical	Diabetes[19, 20, 31, 32, 36-40]
	Family history[20, 41-45]
	Hypertension[19, 39, 46, 47]
	Ionizing radiation (low and high dose)[48]
	Myopia (>1 D)[32, 49, 50]
	Obesity[33, 34, 39]
	Systemic corticosteroid use[51]
	Trauma[52]
	Ultraviolet-B light exposure[21, 32, 41, 53, 54]
Nuclear	Diabetes[32, 39]
	Family history[41, 44, 55, 56]
	Hypertension[57, 58]
	Myopia[19, 20, 32, 59-62]
	Obesity[63]
	Prior PPV[29, 64, 65]
	Smoking[19, 32, 49, 66-72]
	Tobacco (smokeless)[73]
	Ultraviolet-B light exposure[54, 74]
Posterior subcapsular	Diabetes[19, 20, 31, 36, 39]
	Hypertension[19, 57, 75, 76]
	Corticosteroids (inhaled orally)[77]
	Ionizing radiation (low and high dose)[48, 78, 79]
	Myopia[19, 32, 59, 60, 62, 75]

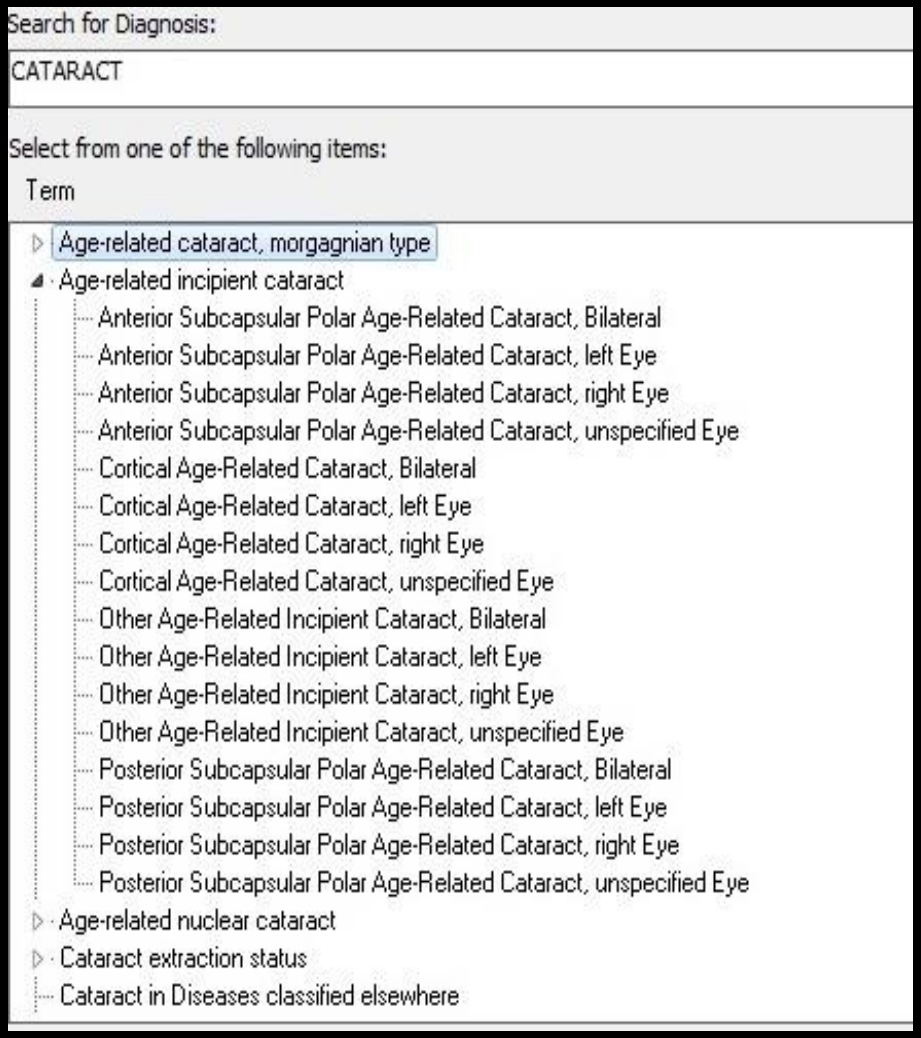
TABLE 1 FACTORS ASSOCIATED WITH INCREASED RISK OF CATARACT DEVELOPMENT* (CONTINUED)

Cataract Type	Associated Risk Factors
Posterior subcapsular (continued)	Obesity[33, 63]
	Ocular trauma[52]
	Prior PPV[29]
	Retinitis pigmentosa[80-82]
	Smoking[71, 72]
	Systemic corticosteroid use[83]
	Topical corticosteroid use[84]
	Trauma[52]
Mixed	Diabetes[38, 39]
	Hypertension[19]
	Inactivity[85, 86]
	Inhaled corticosteroid use[87-90]
	Intravitreal corticosteroids[91, 92]
	Ionizing radiation (low and high dose)[78, 79, 93-96]
	Lower education[20, 31, 97, 98]
	Ocular inflammatory disease[99]
	Prior PPV[29]
	Smoking[72, 100, 101]
	Tobacco use (smoking and smokeless)[73]
	Trauma[102]
	Ultraviolet-B light exposure[21]

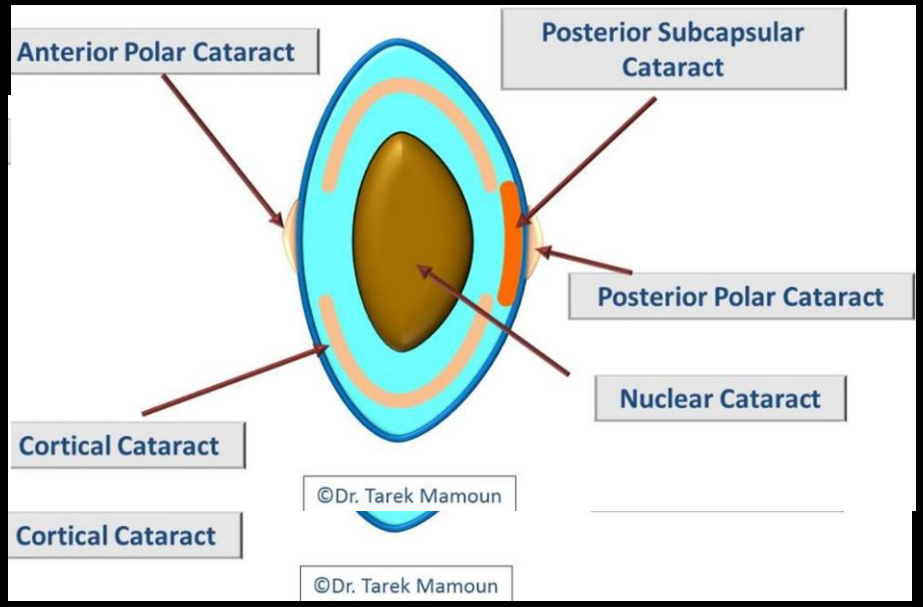
AMERICAN ACADEMY OF OPHTHALMOLOGY
Cataract in the Adult Eye Preferred Practice Pattern®
2021

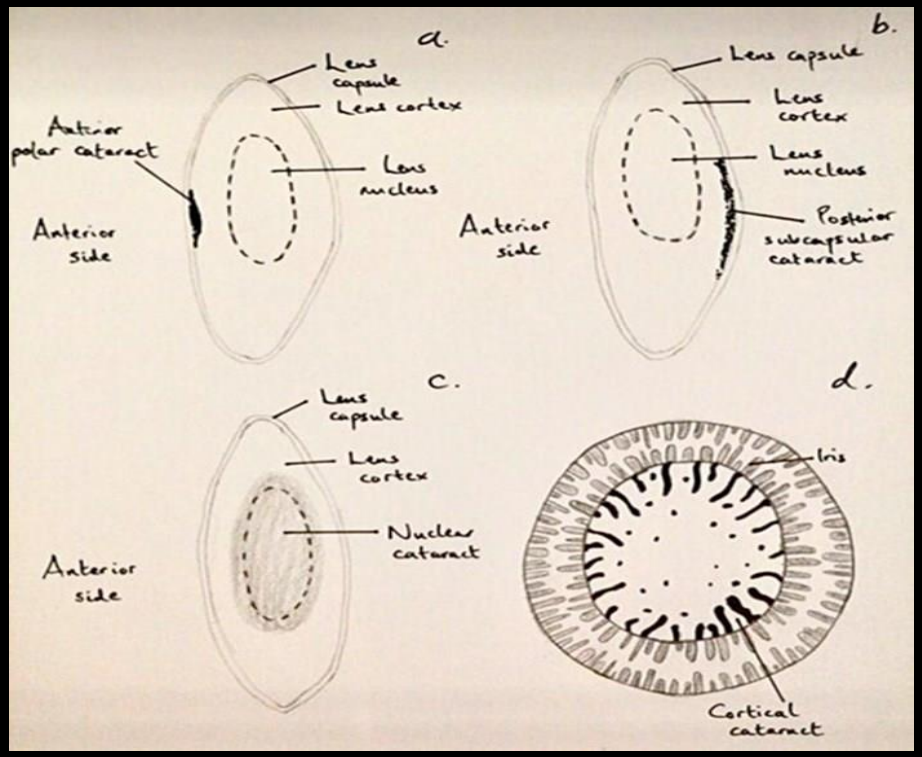
HOW TO CLASSIFY CATARACTS





STEP 1
DETERMINE LOCATION OF LENS OPACITY





Evaluate / document the lens from front to back.
As needed: 1-4 ACC / 1-4 NS / 1-4 PCC / +/- PSC central/diffuse
As needed: add if cortical or PSC into visual axis or not

STEP 2

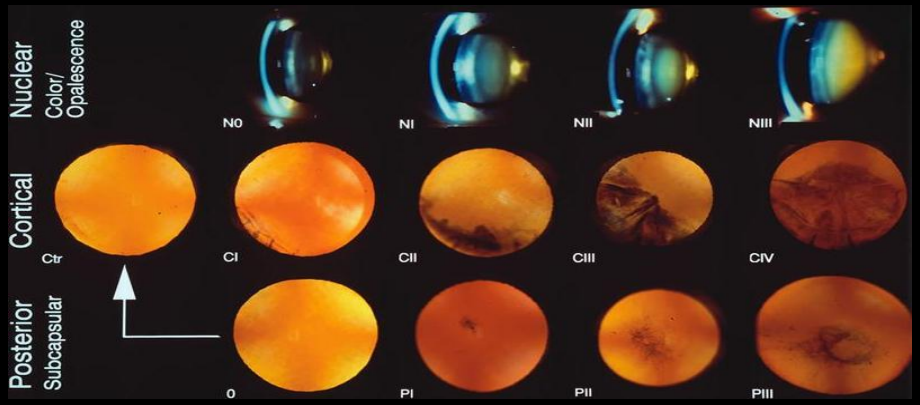
GRADE THE CATARACT

Grading the Three Common Types of Cataracts*

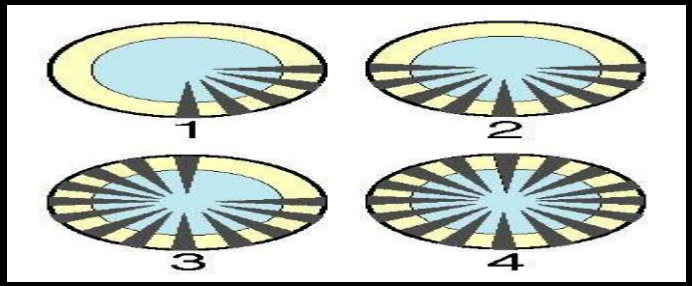
Cataract Type	Grade 1	Grade 2	Grade 3	Grade 4
Nuclear Yellowing and sclerosis of the lens nucleus	Mild	Moderate	Pronounced	Severe
Cortical Measured as aggregate percentage of the intrapupillary space occupied by the opacity	Obscures 10% of intra-pupillary space	Obscures 10%-50% of intra-pupillary space	Obscures 50%-90% of intra-pupillary space	Obscures more than 90% of intra-pupillary space
Posterior subcapsular Measured as aggregate percentage of the posterior capsular area occupied by the opacity	Obscures 3% of the area of the posterior capsule	Obscures 30% of the area of the posterior capsule	Obscures 50% of the area of the posterior capsule	Obscures more than 50% of the area of the posterior capsule

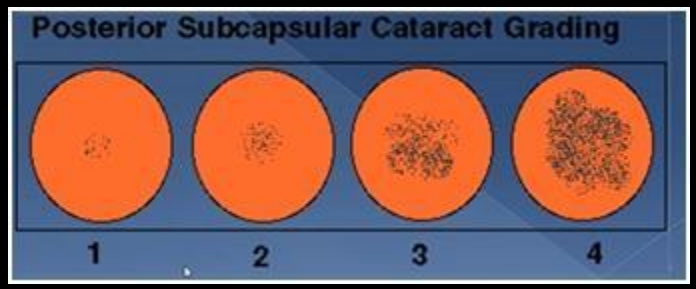
* Designation of cataract severity that falls between grade levels can be made by addition of a + sign (e.g., 1+, 2+). Grading of cataracts is usually done when the pupil is dilated.

AOA CLINICAL PRACTICE GUIDELINES



The Lens Opacity Classification System II (LOCS II) photographic grading standards.





- MY OPINION…
  - CORTICAL IS EASY = HOW MANY QUADS? TR-4, IN VISUAL AXIS?
  - NS = POOR AGREEMENT, VERY SUBJECTIVE, TR-4 (4 = NO VIEW)
  - PSC = IS IT REALLY THERE OR NOT? +FOCAL PSC OR DIFFUSE

- GRADE IS NOT FOR CODING
  - IS FOR CORRELATING WITH VISION, MONITORING FOR CHANGE, ETC.

NEED TO KNOW

- CLINICAL SIGNS
  - STAGES OF CATARACTS
    - CORTICAL
      - IS EASY
    - NUCLEAR
      - HARDER TO AGREE ON
      - DO NOT “OVER STAGE” THE LENS
    - TRACE – 4
      - ACC / NS / PCC / PSC
        - » RECORD FRONT TO BACK
  - DOES APPEARANCE CORRESPOND TO VA OR IS IT SOMETHING ELSE?
    - IF NOT SURE
      - EVALUATE SCAN MACULA / ONH
    - CONSIDER LUBRICATION
      - RTC TO REPEAT REFRACTION
    - CONSIDER VF OR REFER FOR FA / OCTA
- TESTING
  - VA / PINHOLE, REFRACTION
  - WHEN TO USE
    - BAT, BSCAN
- FOLLOW-UP IF MONITORING
  - 1 or 2 YRS IF 20/20 CATARACTS
  - 6 MOS IF VA IS DECREASING
- IS PATIENT ELIGIBLE TO REFER?
  - 20/40 AND IF ADLS IMPACTED
  - 20/30 COMPLAINING OF GLARE
  - HAVE TO BE HEALTHY ENOUGH
    - A1C < 9, HEART SURGERY > 6 M, CVA > 9 M
- PATIENT EDUCATION
  - REVIEWED CATARACTS
    - BASICS OF SURGICAL PROCEDURE
      - PHACO VS FEMTOSECOND LASER
    - POTENTIAL COMPLICATIONS
      - INFECTION, INFLAMMATION, RD, ETC.
    - IOL OPTIONS
      - STANDARD / TORIC / MULTIFOCALS
    - POST-OP FOLLOW-UP
      - VA: 1 DAY, 1 MONTH, BACK TO OD
      - ANTIBIOTIC X 1 WEEK
      - STEROID X 1 MO W TAPER
      - KNOW WORRISOME SIGNS / SYMPTOMS
      - WHEN TO DO DFE (THAT DAY OR IF SYMPTOMS)

DM RETINOPATHY

"…the most common early clinically visible manifestations of diabetic retinopathy include microaneurysm formation and intraretinal hemorrhages. Microvascular damage leads to retinal capillary nonperfusion, cotton wool spots, an increased number of hemorrhages, venous abnormalities, and intraretinal microvascular abnormalities (IRMA). During this stage, increased vasopermeability can result in retinal thickening (edema) and/or exudates that may lead to a loss in central visual acuity. The proliferative stage results in proliferation of new vessels on the disc, retina, and iris, and in the filtration angle. These new vessels then lead to traction retinal detachments and neovascular glaucoma, respectively."

AAO PPP 2019

RISK FACTORS

- DURATION OF DIABETES (ask how long your patient has been a diabetic!)
  - TYPE 1:
    - 25% AT 5 YRS, 60% AT 10YRS, 80% AT 15YRS HAVE RET
    - PDR IN 50% AT 20 YRS
  - TYPE 2:
    - 40% AT 5 YRS IF INSULIN (84% 19 YRS)
    - 24% AT 5 YRS IF NO INSULIN HAVE RET (53% 19 YRS)
    - PDR IN 2% AT 5 YRS, 25% AT 25 YRS
- SEVERITY OF HYPERGLYCEMIA (pull in last A1c or ask pt if done privately what last A1c was or at least last BS reading)
  - ONCE RETINOPATHY PRESENT, THIS IS THE MORE IMPORTANT RISK FACTOR
  - TARGET A1C IS 7% OR LOWER (SOME NEED < 6.5%)
  - INCREASED A1C ASSOCIATED WITH INCREASED RISK OF DME
- INCONCLUSIVE
  - INTENSIVE MANAGEMENT OF HYPERTENSION
  - MANAGEMENT OF SERUM LIPID LEVELS
- OTHERS WITH LESS AGREEMENT
  - AGE
  - TYPE OF DIABETES
  - CLOTTING FACTORS
  - RENAL DISEASE
  - PHYSICAL INACTIVITY
  - INFLAMMATORY BIOMARKERS
  - USE OF ACE INHIBITORS
- TO BE CONSIDERED
  - METABOLIC SYNDROME
  - RAPID REDUCTION IN A1C ON OWN OR FROM NEWER MEDS (OZEMPIC, ETC.)

DIABETIC CAUSES OF VISION LOSS

- MACULAR EDEMA
- BLEEDING
  - VITREOUS HEMORRHAGE
  - PRERETINAL HEMORRHAGE
- TRACTIONAL RETINAL DETACHMENT
- NEOVASCULAR GLAUCOMA
- BUT ALSO…
  - MACULAR ISCHEMIA
    - CAPILLARY NONPERFUSION CANNOT BE VISUALIZED
    - NEED IV FLUORESCEIN OR OCTA

HOW TO CLASSIFY DM RETINOPATHY

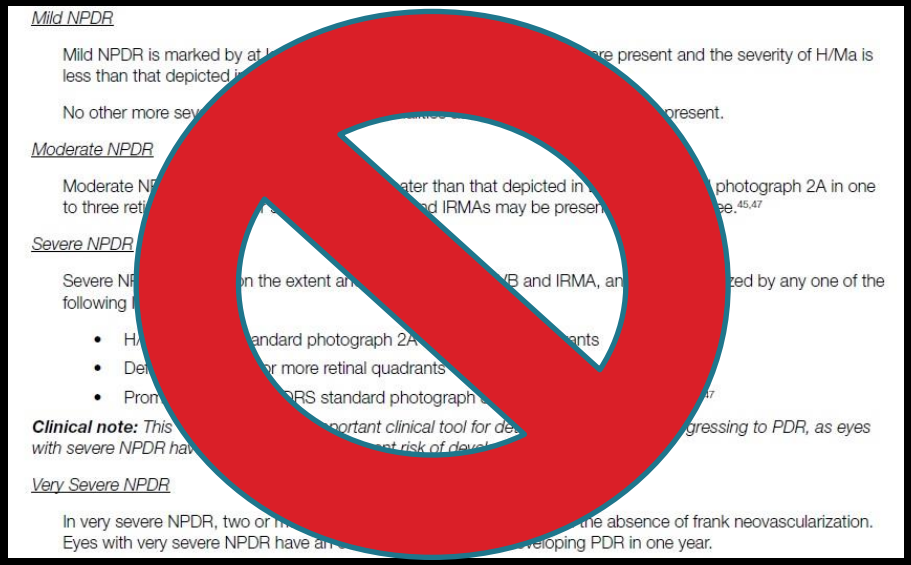
RETINA - DM / VASCULAR

DM Type 1 w/ Diab Mac Edema,Resolved Post Tx,Right Eye	E10.37X1
DM Type 1 w/ Diab Mac Edema,Resolved Post Tx,Left Eye	E10.37X2
DM Type 1 w/ Diabetic Ophthalmic Complication	E10.39
DM Type 1 w/ Mild NPDR w/ Macula Edema,Right Eye	E10.3211
DM Type 1 w/ Mild NPDR w/ Macula Edema,Left Eye	E10.3212
DM Type 1 w/ Mild NPDR w/o Macula Edema,Right Eye	E10.3291
DM Type 1 w/ Mild NPDR w/o Macula Edema,Left Eye	E10.3292
DM Type 1 w/ Mod NPDR w/ Macula Edema,Left Eye	E10.3312
DM Type 1 w/ Mod NPDR w/ Macula Edema,Right Eye	E10.3311
DM Type 1 w/ Mod NPDR w/o Macula Edema,Right Eye	E10.3391
DM Type 1 w/ Mod NPDR w/o Macula Edema,Left Eye	E10.3392
DM Type 1 w/ PDR w/ Comb Ret Detach,Left Eye	E10.3542
DM Type 1 w/ PDR w/ Comb Ret Detach,Right Eye	E10.3541
DM Type 1 w/ PDR w/ Macula Edema,Left Eye	E10.3512
DM Type 1 w/ PDR w/ Macula Edema,Right Eye	E10.3511
DM Type 1 w/ PDR w/ Tract Ret Detach in Macula,Right Eye	E10.3521
DM Type 1 w/ PDR w/ Tract Ret Detach in Macula,Left Eye	E10.3522
DM Type 1 w/ PDR w/ Tract Ret Detach not in Macula,Right Eye	E10.3531
DM Type 1 w/ PDR w/ Tract Ret Detach not in Macula,Left Eye	E10.3532
DM Type 1 w/ PDR w/o Macula Edema,Left Eye	E10.3592
DM Type 1 w/ PDR w/o Macula Edema,Right Eye	E10.3591
DM Type 1 w/ PDR,Stable,Left Eye	E10.3552
DM Type 1 w/ PDR,Stable,Right Eye	E10.3551
DM Type 1 w/ Severe NPDR w/ Macula Edema,Right Eye	E10.3411
DM Type 1 w/ Severe NPDR w/ Macula Edema,Left Eye	E10.3412
DM Type 1 w/ Severe NPDR w/o Macula Edema,Right Eye	E10.3491
DM Type 1 w/ Severe NPDR w/o Macula Edema,Left Eye	E10.3492
DM Type 1 w/o Complications	E10.9

RETINA - DM / VASCULAR

DM Type 2 w/ Diabetic Ophthalmic Complications	E11.39
DM Type 2 w/ Mac Edema,Resolved Post Tx,Right Eye	E11.37X1
DM Type 2 w/ Mac Edema,Resolved Post Tx,Left Eye	E11.37X2
DM Type 2 w/ Mild NPDR w/ Macula Edema,Right Eye	E11.3211
DM Type 2 w/ Mild NPDR w/ Macula Edema,Left Eye	E11.3212
DM Type 2 w/ Mild NPDR w/o Macula Edema,Right Eye	E11.3291
DM Type 2 w/ Mild NPDR w/o Macula Edema,Left Eye	E11.3292
DM Type 2 w/ Mod NPDR w/ Macula Edema,Left Eye	E11.3312
DM Type 2 w/ Mod NPDR w/ Macula Edema,Right Eye	E11.3311
DM Type 2 w/ Mod NPDR w/o Macula Edema,Right Eye	E11.3391
DM Type 2 w/ Mod NPDR w/o Macula Edema,Left Eye	E11.3392
DM Type 2 w/ PDR w/ Comb Ret Detach,Left Eye	E11.3542
DM Type 2 w/ PDR w/ Comb Ret Detach,Right Eye	E11.3541
DM Type 2 w/ PDR w/ Macular Edema,Left Eye	E11.3512
DM Type 2 w/ PDR w/ Macular Edema,Right Eye	E11.3511
DM Type 2 w/ PDR w/ Tract Ret Detach in Macula,Right Eye	E11.3521
DM Type 2 w/ PDR w/ Tract Ret Detach in Macula,Left Eye	E11.3522
DM Type 2 w/ PDR w/ Tract Ret Detach not in Macula,Right Eye	E11.3531
DM Type 2 w/ PDR w/ Tract Ret Detach not in Macula,Left Eye	E11.3532
DM Type 2 w/ PDR w/o Macular Edema,Left Eye	E11.3592
DM Type 2 w/ PDR w/o Macular Edema,Right Eye	E11.3591
DM Type 2 w/ PDR,Stable,Left Eye	E11.3552
DM Type 2 w/ PDR,Stable,Right Eye	E11.3551
DM Type 2 w/ Severe NPDR w/ Macula Edema,Right Eye	E11.3411
DM Type 2 w/ Severe NPDR w/ Macula Edema,Left Eye	E11.3412
DM Type 2 w/ Severe NPDR w/o Macula Edema,Right Eye	E11.3491
DM Type 2 w/ Severe NPDR w/o Macula Edema,Left Eye	E11.3492
DM Type 2 w/o Complications	E11.9

HOW TO CLASSIFY NPDR?
AOA CPG 2019 vs AAO PPP 2019



Mild NPDR

Mild NPDR is marked by at l… re present and the severity of H/Ma is less than that depicted i…

No other more sev… resent.

Moderate NPDR

Moderate NP… ater than that depicted in … photograph 2A in one to three reti… nd IRMAs may be presen… e.[45,47]

Severe NPDR

Severe NP… n the extent an… B and IRMA, an… zed by any one of the following …

- H… andard photograph 2A… ants
- Del… r more retinal quadrants…
- Pron… RS standard photograph …[47]

Clinical note: *This … portant clinical tool for de… gressing to PDR, as eyes with severe NPDR hav… nt risk of devel…*

Very Severe NPDR

In very severe NPDR, two or m… the absence of frank neovascularization. Eyes with very severe NPDR have an … veloping PDR in one year.

TABLE 1 Diabetic Retinopathy Disease Severity Scale and International Clinical Diabetic Retinopathy Disease Severity Scale

Disease Severity Level	Findings Observable upon Dilated Ophthalmoscopy
No apparent retinopathy	No abnormalities
Mild NPDR (see Glossary)	Microaneurysms only
Moderate NPDR (see Glossary)	More than just microaneurysms but less than severe NPDR
Severe NPDR	
U.S. definition	Any of the following (4-2-1 rule) and no signs of proliferative retinopathy: • Severe intraretinal hemorrhages and microaneurysms in each of **4** quadrants • Definite venous beading in **2** or more quadrants • Moderate IRMA in **1** or more quadrants
International definition	Any of the following and no signs of proliferative retinopathy: • More than 20 intraretinal hemorrhages in each of **4** quadrants • Definite venous beading in **2** or more quadrants • Prominent IRMA in **1** or more quadrants
PDR	One or both of the following: • Neovascularization • Vitreous/preretinal hemorrhage

IRMA = intraretinal microvascular abnormalities; NPDR = nonproliferative diabetic retinopathy; PDR = proliferative diabetic retinopathy

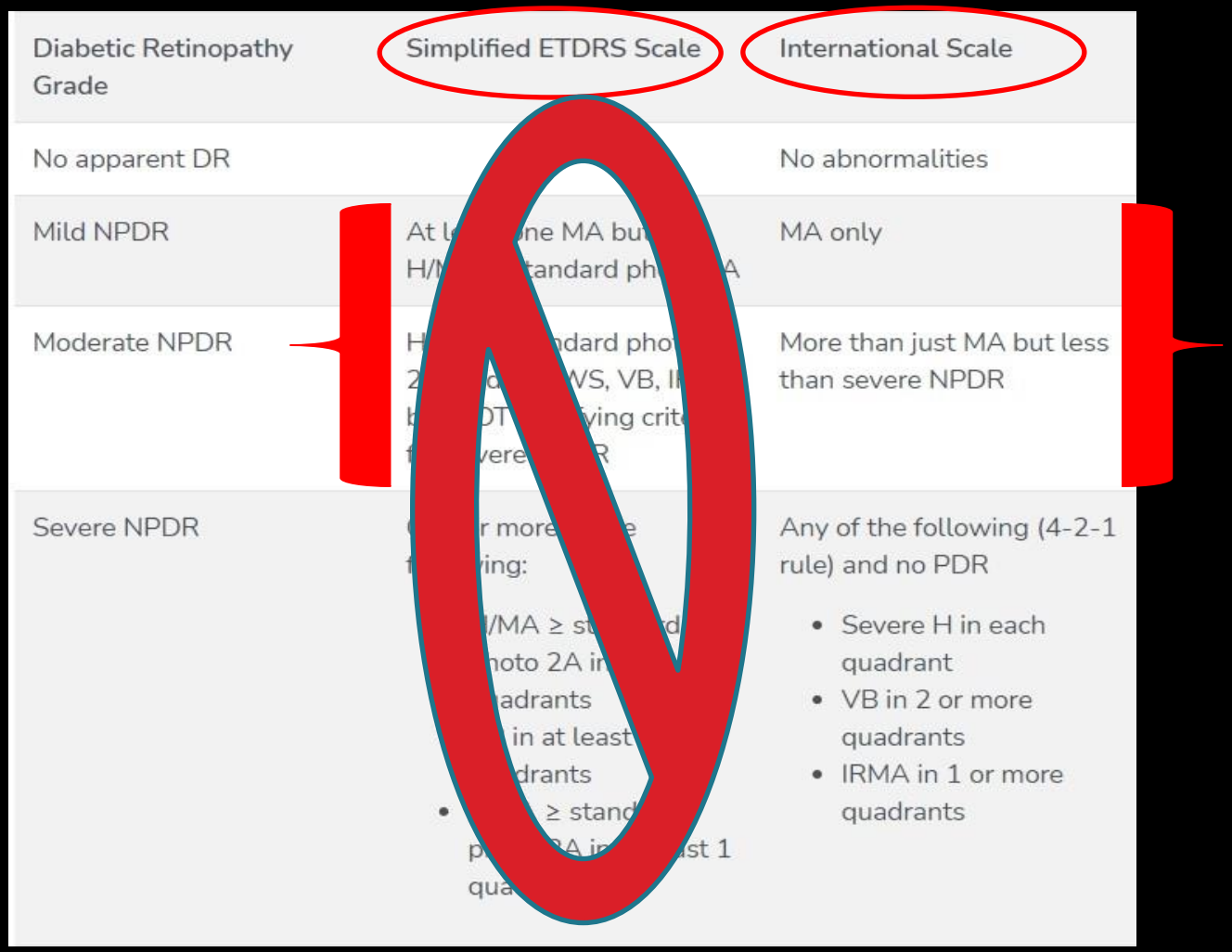
NOTES:

- Any patient with two or more of the characteristics of severe NPDR is considered to have very severe NPDR.

ETDRS VS INTERNATIONAL SCALE

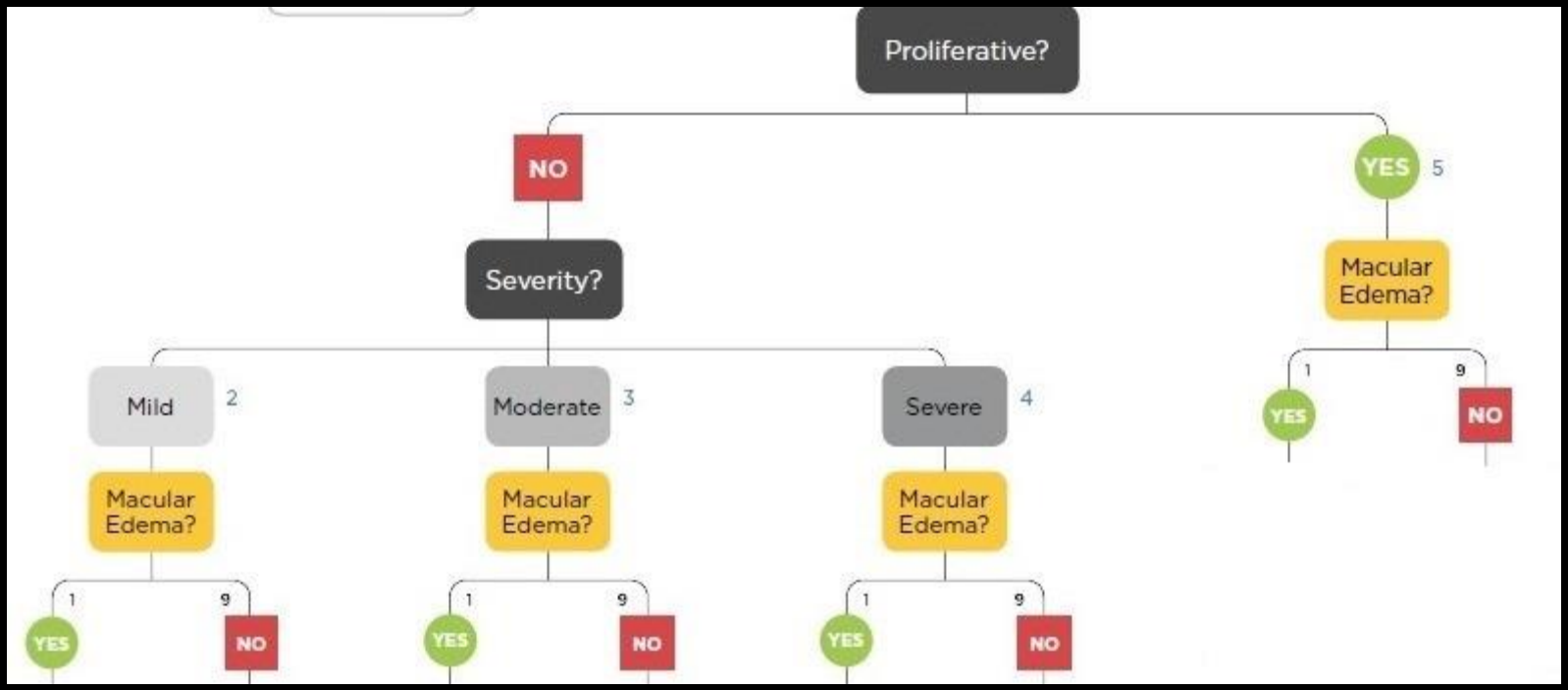
USED BY: AOA CPG, KANSKI, ETC. USED BY: AAO PPP, WILLS EYE MANUAL, ETC.

THERE ARE A FEW SLIGHT DIFFERENCES



Diabetic Retinopathy Grade	Simplified ETDRS Scale	International Scale
No apparent DR		No abnormalities
Mild NPDR	At l ne MA bu H/ tandard ph A	MA only
Moderate NPDR	H ndard pho 2 WS, VB, I ying crit vere R	More than just MA but less than severe NPDR
Severe NPDR	r more ving: /MA ≥ st d hoto 2A i adrants in at least drants ≥ stand p A i st 1 qua	Any of the following (4-2-1 rule) and no PDR • Severe H in each quadrant • VB in 2 or more quadrants • IRMA in 1 or more quadrants

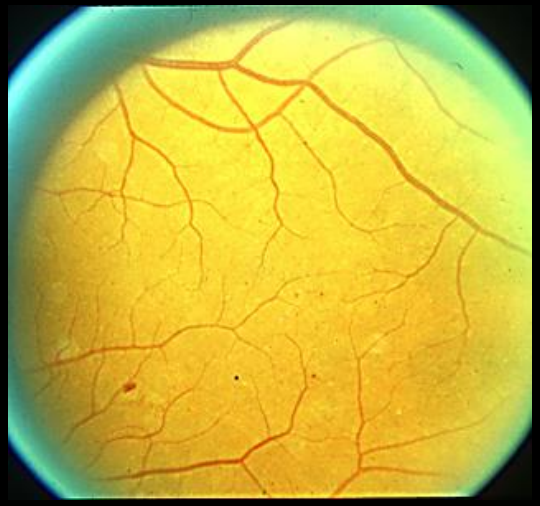
THEN…
NON-PROLIFERATIVE OR PROLIFERATIVE?



MILD NPDR

- APPEARANCE
  - ETDRS
    - AT LEAST 1 MICROANEURYSM (<125 um)
      - HEMES < STANDARD PHOTO 2A
    - SMALL RETINAL HEMES (>125 um)
    - HARD EXUDATES

  OR
  - INTERNATIONAL
    - MICROANEUYRSMS ONLY
      - RED SPOTS < 125 um
- MACULAR EDEMA
  - MAY OR MAY NOT BE PRESENT
- FOLLOW-UP
  - < 2A = 1 YR
  - ≥ 2A = 6 MOS
    - WOULD WANT TO KNOW MORE ABOUT PATIENT
      - HOW ARE A1C / BP / CHOL DOING?
      - IS A1C GOING DOWN OR UP?
      - DO THEY TAKE THEIR MEDS, ETC.?
      - ON INSULIN VS OTHER?
        - » OZEMPIC < 1YR?



MAs / Hemes < 125 um

< STANDARD PHOTO 2A

MAs / Hemes ≥ 125 um

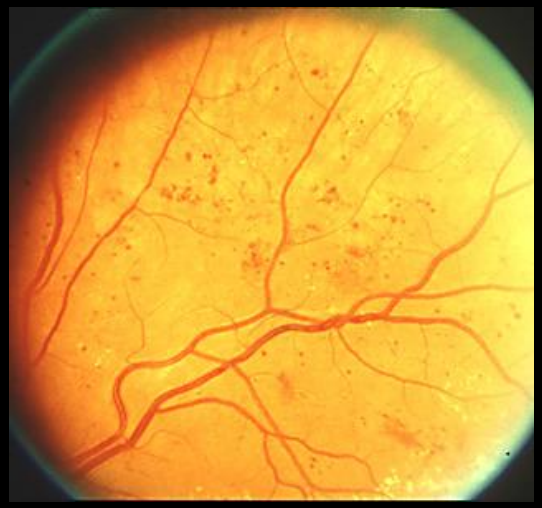
STANDARD PHOTO 2A

MODERATE NPDR

- APPEARANCE
  - ETDRS
    - HEMES / MAS ≥ PHOTO 2A
      - > 20 HEMORRHAGES
    - COTTON WOOL SPOTS
    - MILD VENOUS BEADING
    - MILD IRMA

  OR
  - INTERNATIONAL
    - GREATER THAN MILD BUT LESS THAN SEVERE
- MACULAR EDEMA
  - MAY OR MAY NOT BE PRESENT
- FOLLOW-UP
  - 6 MONTHS

STANDARD PHOTO 2A



> PHOTO 2A

Table 2. Risk of Progression to Proliferative Diabetic Retinopathy (PDR)[32] and High-Risk PDR[34] in the Early Treatment Diabetic Retinopathy Study.

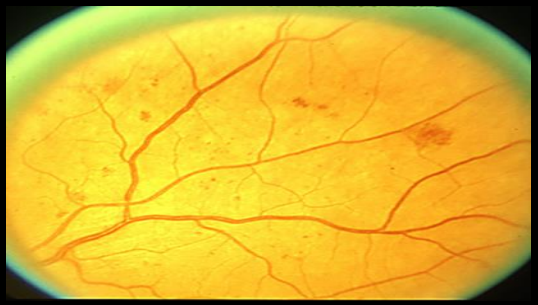
DRSS Level	1-y, Any PDR	5-y, Any PDR
(moderate NPDR)	12%	44%
47 (moderately severe NPDR)	26%	66%
53a to d (severe NPDR)	44% - 51%	75% - 81%
53e (very severe NPDR)	75%	90%
61 (mild PDR)	–	–
≥ 65 (moderate PDR)	–	–

INTERNATIONAL / ETDRS SEVERE NPDR

- APPEARANCE
  - 4 QUADS OF HEMES (vs > 2A)
    - > 20 HEMORRHAGES IN EACH QUADRANT

  OR
  - 2 QUADS OF VENOUS BEADING (vs > 6A)

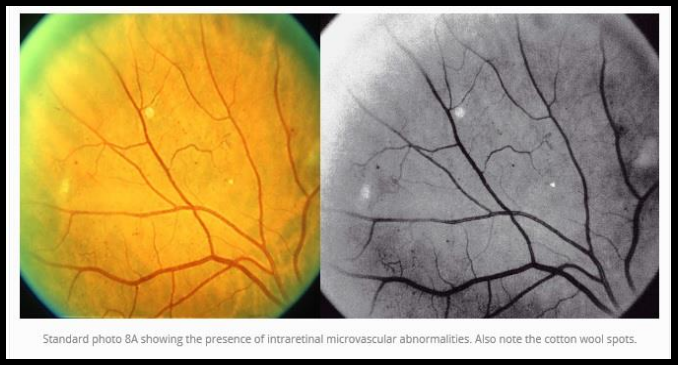
  OR
  - 1 QUAD OF IRMA (vs > 8A)
- MACULAR EDEMA
  - MAY OR MAY NOT BE PRESENT
- FOLLOW-UP
  - RETINA CONSULT
    - CONSIDER ANTI-VEGF
      - PER PANORAMA / RISE / RIDE STUDIES
        - » REDUCES STAGE OF RETINOPATHY



Standard photographs 6A and 6B, less and more severe standards for venous beading. ETDRS extension of the Modified Airlie House classification of diabetic retinopathy. (A) Less severe standard (6A). Two branches of the superior temporal venule show beading that is definite but not severe. (B) More severe standard (6B). Most large and small venule branches show severe beading. You should also note the presence of IRMA in both photos (discussed next).

Table 2. Risk of Progression to Proliferative Diabetic Retinopathy (PDR)[33] and High-Risk PDR[34] in the Early Treatment Diabetic Retinopathy Study.

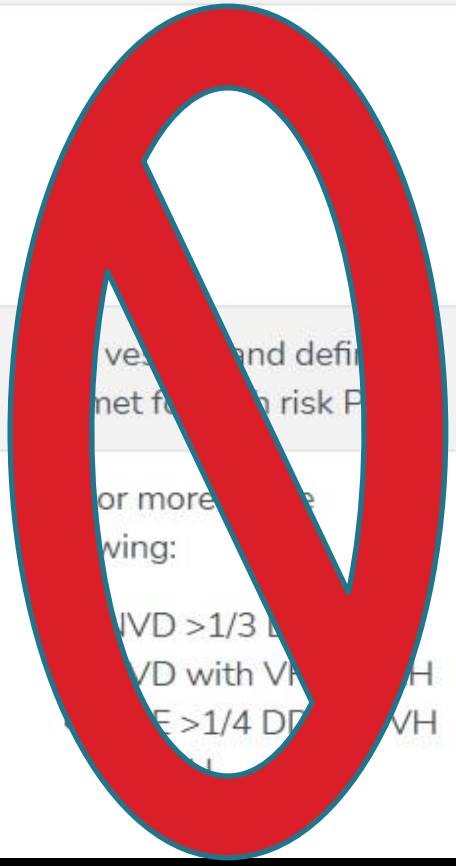
DRSS Level	1-y, Any PDR	5-y, Any PDR
43 (moderate NPDR)	12%	44%
47 (moderately severe NPDR)	26%	66%
[illegible]severe NPDR)	44% - 51%	75% - 81%
53e (very severe NPDR)	75%	90%
61 (mild PDR)	-	-
≥ 65 (moderate PDR)	-	-



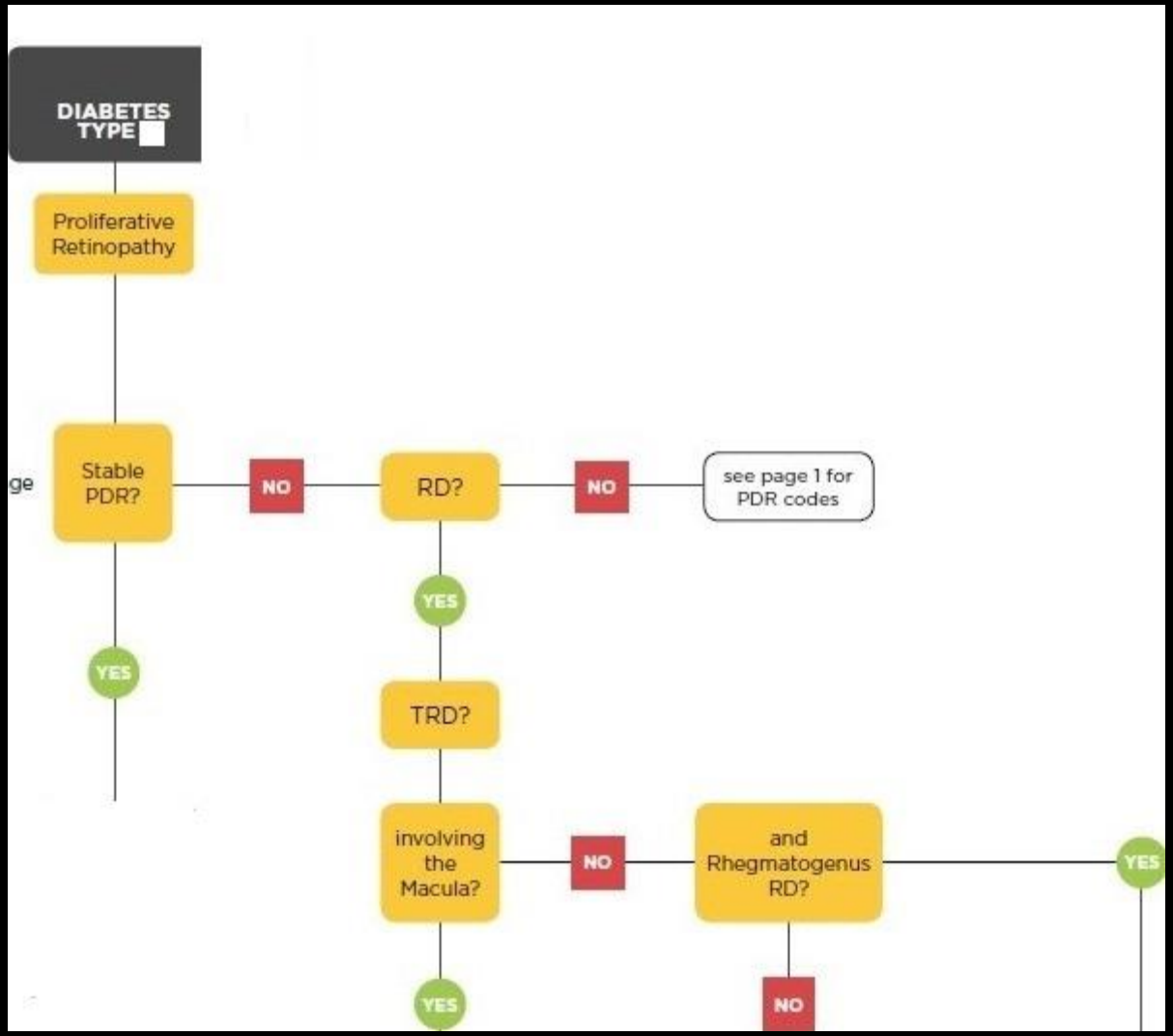
Standard photo 8A showing the presence of intraretinal microvascular abnormalities. Also note the cotton wool spots.

HOW TO CLASSIFY PDR
THERE ARE SLIGHT DIFFERENCES

Diabetic Retinopathy Grade	Simplified ETDRS Scale	International Scale
PDR		One or more of the following: • Neovascularization • VH or PRH
Early PDR	ve nd defi net f risk P	
High risk PDR	or more wing: VD >1/3 VD with V H E >1/4 D VH	

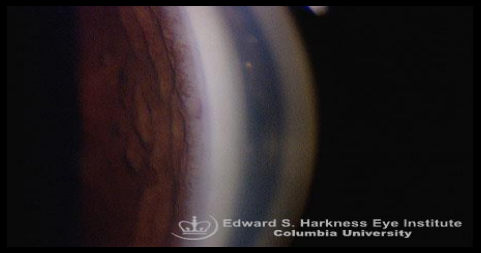


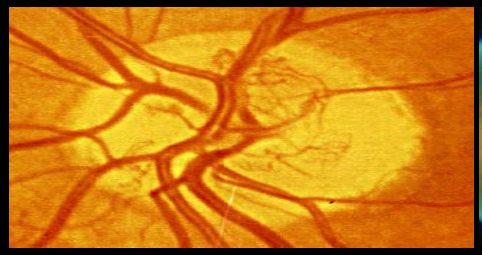
PROLIFERATIVE RETINOPATHY

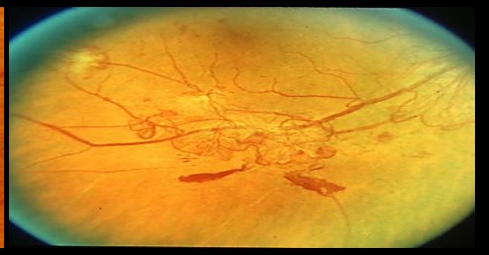


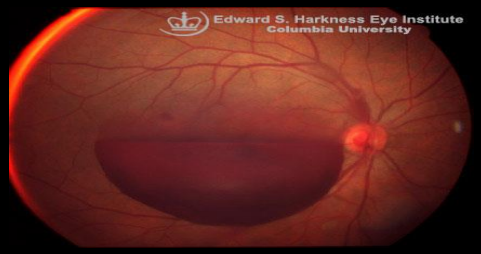
PROLIFERATIVE DIABETIC RETINOPATHY

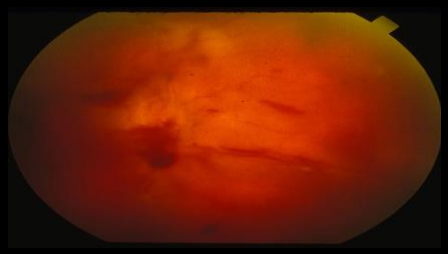
- SIGNS
  - NVD, NVE, NVI, NVA
  - PRE-RETINAL HEME
  - VITREOUS HEME
  - TRACTIONAL RD
- LOOK FOR
  - MACULAR EDEMA





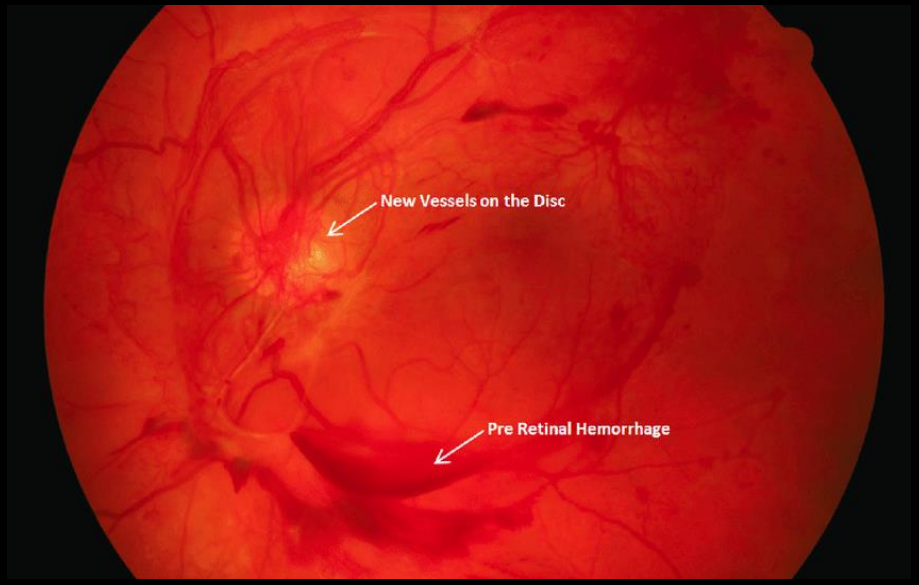






HIGH RISK PDR

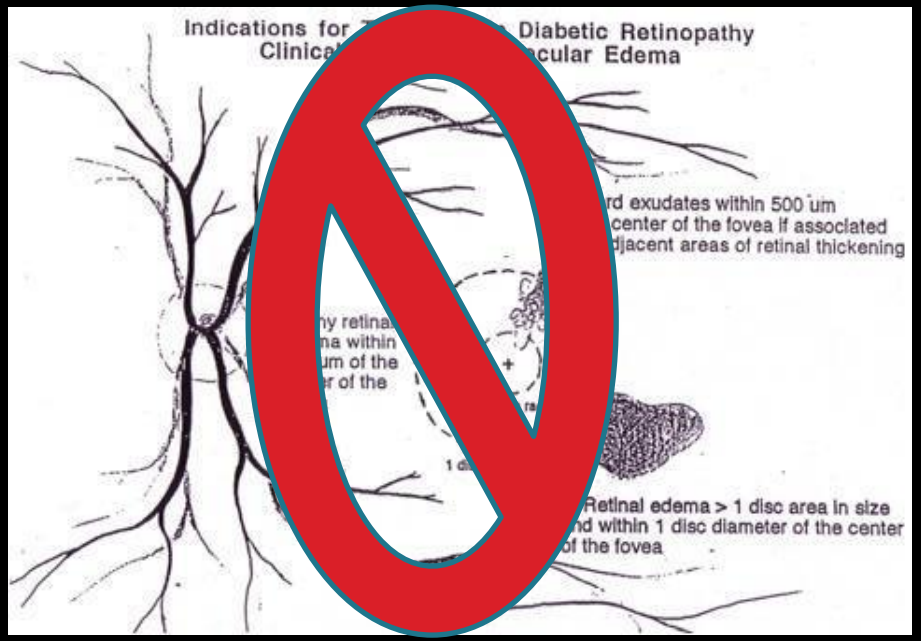
- NOT FOR CODING
  - BUT USED FOR RISK OF VISION LOSS / URGENCY OF REFERRAL
- APPEARANCE
  - NVD (W/I 1DD) > PHOTO 10A (1/4 TO 1/3DD)
  - NVD (W/I 1DD) IF FRESH VIT HEME OR PRE-RETINAL HEME
  - NVE > PHOTO 7 IF FRESH VIT HEME OR PRE-RETINAL HEME



HOW TO CLASSIFY DIABETIC MACULAR EDEMA

Diabetic Macular Edema Grade	ETDRS Scale	International Scale
No DME		No retinal thickening or hard exudates in the macula
Noncentral-involved DME		Retinal thickening in the macula that does not involve the central 1mm
Central-involved DME		Retinal thickening in the macula involving the central 1mm
CSME	he o of the llowi • Ret ckenin with m of cente mac • HE wit 0µn the cent he macula i with thick adjacent re A zone or zo retinal thicke e isc area in s ast part of is hin one center of ta	

TIMES HAVE CHANGED



Classification

ICO guidelines for diabetic eyes care 2017

Diabetic Macular Edema	Findings Observable on Dilated Ophthalmoscopy*
No DME	No retinal thickening or hard exudates in the macula
Noncentral-involved DME	Retinal thickening in the macula that does not involve the central subfield zone that is 1mm in diameter
Central-involved DME	Retinal thickening in the macula that does involve the central subfield zone that is 1mm in diameter

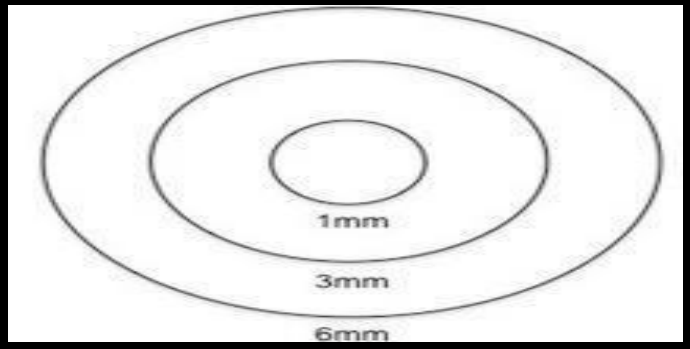
*Hard exudates are a sign of current or previous macular edema. DME is defined as retinal thickening, and this requires a three-dimensional assessment that is best performed by a dilated examination using slit-lamp biomicroscopy and/or stereo fundus photography.

LATEST

DME

DIABETIC MACULAR EDEMA

- PER THE AAO PPP 2019
  - Because the risk of visual loss is greatest if macular edema is at the center of the macula DME is now subdivided as either
    - center involved (CI-DME)
    - OR
    - noncenter-involved (NCI-DME)
  - OCT is the best way to detect and quantitate CI-DME and recent clinical trials have required CI-DME as inclusion criteria.



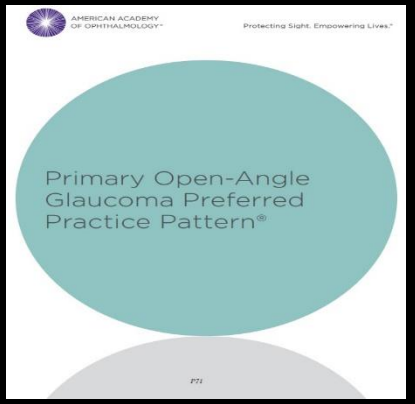
- USING THE OCT
  - IS THERE DME?
    - NO
      - MEANS NO RETINAL THICKENING OR EXUDATES IN THE MACULA
    - YES, IS IT…
      - CENTER INVOLVED
        - » THICKENING IN THE MACULA THAT INVOLVES CENTRAL SUBFIELD ZONE = 1 mm
      - OR
      - NON-CENTER INVOLVED
        - » THICKENING IN THE MACULA THAT DOES NOT INVOLVE THE CENTRAL SUBFIELD ZONE = 1 mm
  - RECORD THE CST
    - = CENTRAL SUBFIELD THICKNESS
    - MONITOR FOR CHANGE
    - REFER IF VA < 20/20 OR EDEMA WORSENS

NEED TO KNOW

- CLINICAL SIGNS OF DM RET
- TESTING REQUIRED
  - LABS FOR DIAGNOSIS, MONITORING
  - ROLE OF: PHOTOS, OCT, FA
- STAGES / FOLLOW-UP
  - NONPROLIFERATIVE
    - MILD 1 YR
    - MODERATE 6 MOS OR YEARLY?
    - SEVERE SEND TO RETINA
      - MAY / SHOULD GET ANTI-VEGF
        - » PANORAMA STUDY
  - PROLIFERATIVE
    - TO RETINA
    - BACK TO OD YEARLY OR AS NEEDED DUE TO OTHER CONDITIONS
  - IF OZEMPIC (VA)
    - NO RET, RTC 6 MOS
    - MILD WITHOUT DME, RTC 3-4 MOS
      - IF STABLE X 2 VISITS, RTC 6 MOS
    - MODERATE / SEVERE, RTC 3 MOS
    - SEVERE, RETINA
    - PDR RETINA
- PATIENT EDUCATION
  - REVIEWED DM RET OR NOT
  - KEEP BP/BS/CHOL ALL CONTROLLED DUE TO RISK OF VISION LOSS IF NOT
- MONITOR VS TREATMENT
  - NON-CI DME (> 1 mm FROM FOVEA)
    - MONITOR 3-4 MOS
      - RETINA IF SEVERE NPDR OR PDR
  - CI-DME (WITHIN 1 mm OF FOVEA)
    - OPTOM TO RX NSAID QID
      - RTC 2 MOS, REPEAT OCT (UNDILATED ?)
    - IF NO IMPROVEMENT / WORSENING
      - E-CONSULT / SEND TO RETINA FOR
        - » INTRAVITREAL INJECTIONS
          - » ANTI-VEGF
            - » AVASTIN, LUCENTIS, EYELEA, BEOVU, VABYSMO
        - » OTHER OPTIONS
          - » STEROID, FOCAL LASER
  - PDR
    - SEND TO / E-CONSULT / CC RETINA FOR
      - PRP (SCATTER, ETC.)
      - ANTI-VEGF
      - VITRECTOMY

PRIMARY OPEN-ANGLE GLAUCOMA

"…a chronic, progressive optic neuropathy in adults in which there is a characteristic acquired atrophy of the optic nerve and loss of retinal ganglion cells and their axons. This condition is associated with an open anterior chamber angle by gonioscopy."



AAO PPP 2020

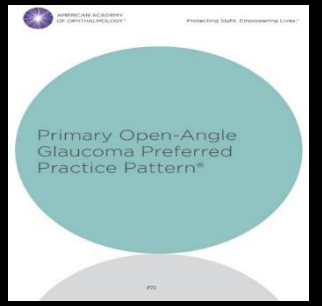
RISK FACTORS ASSOCIATED WITH OPEN-ANGLE GLAUCOMA

- IN NUMEROUS STUDIES
  - ELEVATED IOP
  - OLDER AGE
  - FAMILY HISTORY OF GLAUCOMA
  - AFRICAN RACE OR LATINO / HISPANIC ETHNICITY
  - THIN CENTRAL CORNEA
  - LOW OCULAR PERFUSION PRESSURE
  - TYPE 2 DIABETES MELLITUS
  - MYOPIA
  - LOWER SYSTOLIC AND DIASTOLIC BLOOD PRESSURE
  - HYPOTHYROIDISM*
  - MALE*
  - ---
  - DISC HEMORRHAGE
  - LARGER CUP-TO-DISC RATIO
  - HIGHER PSD ON THRESHOLD VF

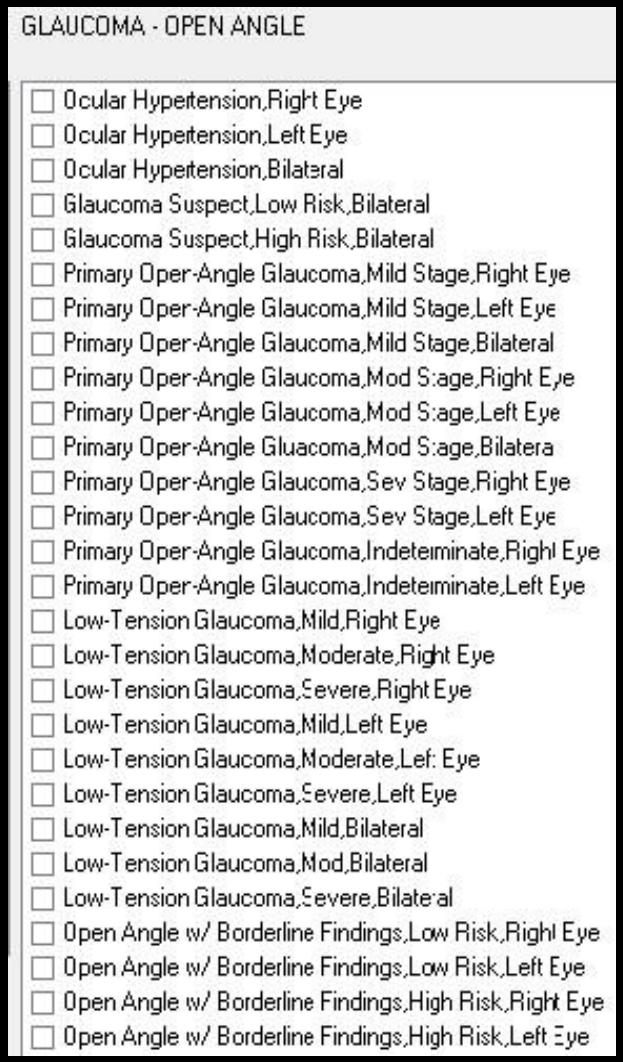
- OTHER FACTORS
  - MIGRAINES
  - SLEEP APNEA*
  - PERIPHERAL VASOSPASM
  - CARDIOVASCULAR DISEASE
  - LOW CORNEAL HYSTERESIS*
  - SYSTEMIC HTN
  - TRANSLAMINAR PRESSURE GRADIENT
  - GENETIC FACTORS

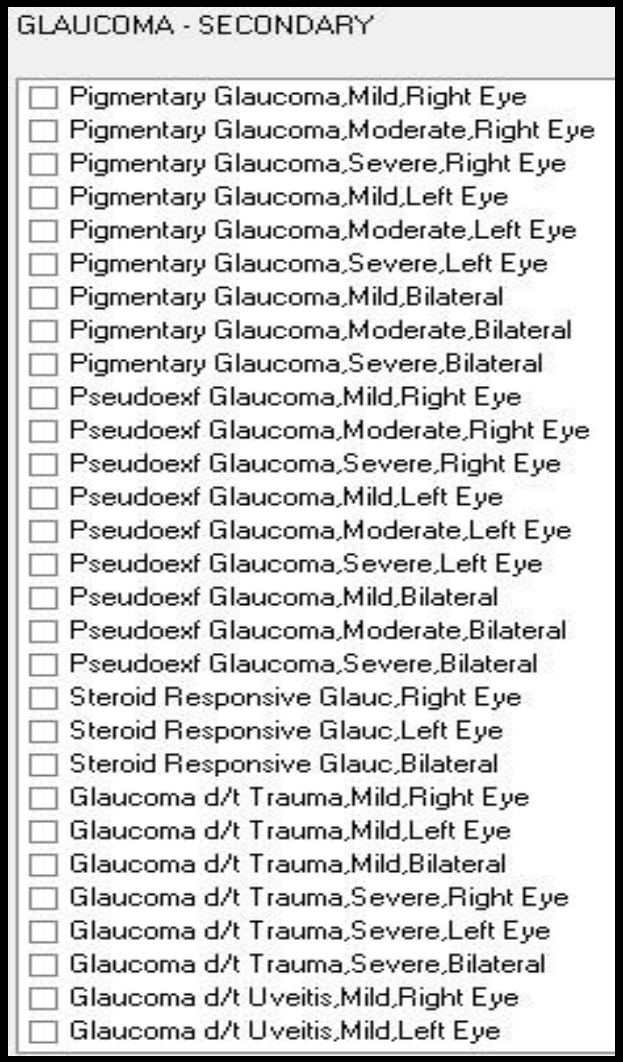
AMERICAN ACADEMY OF OPHTHALMOLOGY
Preferred Practice Pattern

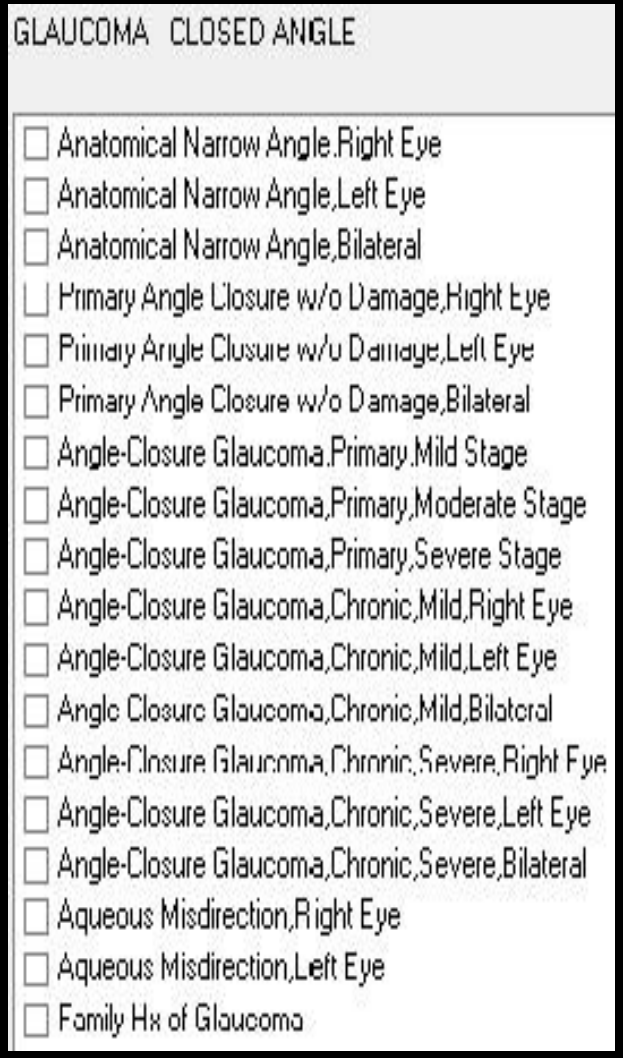
** = NEW AS OF 2020*



HOW TO CLASSIFY GLAUCOMA







HOW TO CLASSIFY GLAUCOMA?
WHAT TYPE OF GLAUCOMA IS IT?

- PRIMARY OPEN-ANGLE
  - A CHRONIC, PROGRESSIVE OPTIC NEUROPATHY IN ADULTS IN WHICH THERE IS CHARACTERISTIC ACQUIRED ATROPHY OF OPTIC NERVE AND LOSS OF RETINAL GANGLION CELLS AND THEIR AXONS.
  - THIS CONDITION IS ASSOCIATED WITH AN OPEN ANTERIOR CHAMBER ANGLE BY GONIOSCOPY.

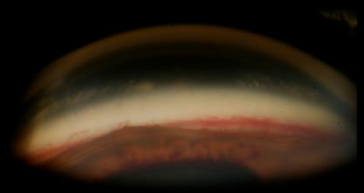
- SECONDARY DEFINITION
  - THE PRESENCE OF ELEVATED IOP AND / OR GLAUCOMATOUS DAMAGE AS THE RESULT OF A SPECIFIC CAUSATIVE ETIOLOGY

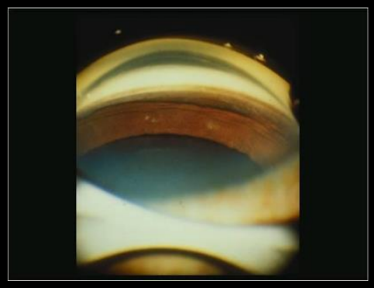
SECONDARY GLAUCOMA

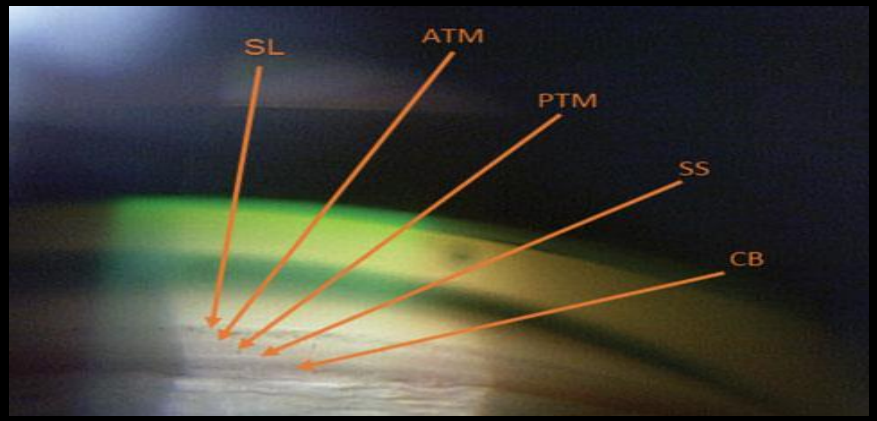
- SECONDARY OPEN-ANGLE
  - PSEUDOEXFOLIATION
  - PIGMENTARY
  - UVEITIC
  - STEROID INDUCED
  - GLAUCOMATOCYCLITIC CRISIS
  - FUCH'S HETEROCHROMIC IRIDOCYCLITIS
  - LENS INDUCED
  - TRAUMATIC
  - ANGLE RECESSION
  - GLAUCOMA WITH HYPHEMA
  - GLAUCOMA WITH INTRAOCULAR HEMORRHAGE
- SECONDARY NARROW / CLOSED-ANGLE
  - PUPILLARY BLOCK
    - PHACOMORPHIC
    - APHAKIC
    - UVEITIC
  - NEOVASCULAR GLAUCOMA
  - IRIDOCORNEAL ENDOTHELIAL SYNDROME
  - INFLAMMATORY
  - FORWARD DISPLACEMENT OF CILIARY BODY
    - CILIARY BLOCK
    - IRIS / CILIARY BODY CYSTS
    - INTRAOCULAR TUMOR
    - CILICHOROIDAL EFFUSION

GONIOSCOPY

- SEVERAL GRADING SYSTEMS CAN BE USED
  - SHAFFER, SPAETH, SCHEIE (1957)
- 4-MIRROR IS PREFERRED
  - LESS INVASIVE, CAN COMPRESS
- WHAT TO LOOK FOR
  - MENTALLY NOTE
    - OPEN, SUSPICIOUSLY NARROW
    - ASYMMETRIC DIFFERENCES
  - <u>SIMPLE METHOD…RECORD THE DEPTH</u>
    - MOST POSTERIOR STRUCTURE VISUALIZED IN ALL QUADRANTS OD AND OS
    - IF NARROW, DOES ANGLE OPEN WITH COMPRESSION?
  - <u>RECORD PRESENCE / ABSENCE OF</u>
    - PIGMENT, PAS, RECESSION, NV







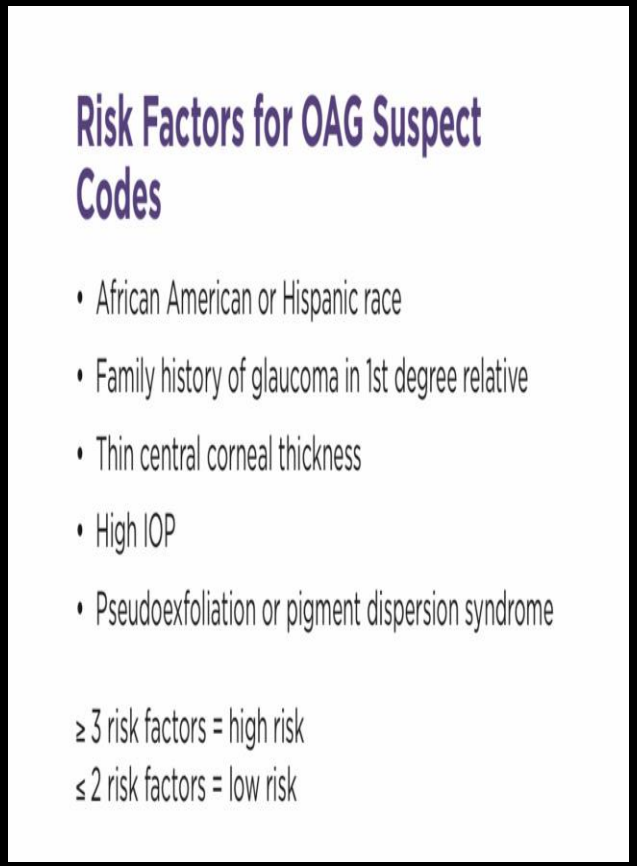
Cymbor, M. Review of Optometry. October 15, 2016

CODING WITH UPDATED TERMINOLOGY

- GLAUCOMA SUSPECT
  - "SOMEONE WHO, FOR ONE OR MORE REASONS, IS AT HIGHER THAN USUAL RISK OF DEVELOPING GLAUCOMATOUS OPTIC NERVE DAMAGE AND VISUAL DEFICIENCY AND THEREFORE WARRANTS CAREFUL FOLLOW-UP."
    - CLINICAL DECISIONS IN GLAUCOMA, 2ND ED
  - "AN INDIVIDUAL WITH **CLINICAL FINDINGS** AND / OR A CONSTELLATION OF **RISK FACTORS** THAT INDICATE AN INCREASED LIKELIHOOD OF DEVELOPING PRIMARY OPEN-ANGLE GLAUCOMA."
    - AAO PPP
- PRE-GLAUCOMA
  - a term used for patients with ocular hypertension (persons with elevated intraocular pressure but no detectable disc or visual field damage), and patients with large cup/disc ratios and normal visual fields who may or may not have early normal-tension glaucoma.
- IF GONIO HAS BEEN DONE…
  - OPEN-ANGLE WITH BORDERLINE FINDINGS, LOW RISK (≤ 2 RISK FACTORS)
  - OPEN-ANGLE WITH BORDERLINE FINDINGS, HIGH RISK (≥ 3 RISK FACTORS)

HOW TO CLASSIFY OAG SUSPECTS (after gonio)

LOW (≤2) OR HIGH RISK (≥3)

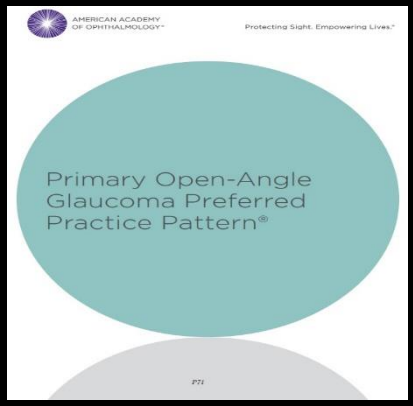


https://www.aao.org/practice-management/news-detail/coding-low-and-high-risk-glaucoma-suspect

- CONSIDER THESE RISK FACTORS
  - HIGHER IOP
  - FAMILY HISTORY OF GLAUCOMA
  - AFRICAN RACE OR LATINO / HISPANIC
  - THINNER CENTRAL CORNEA
  - PSEUDOEXFOLIATION
  - PIGMENT DISPERSION
- JUST A GUIDE, IT IS NOT PERFECT
  - ARE SOME RISK FACTORS MORE IMPORTANT THAN OTHERS?
  - WHAT ABOUT ALL THOSE OTHER RISK FACTORS?

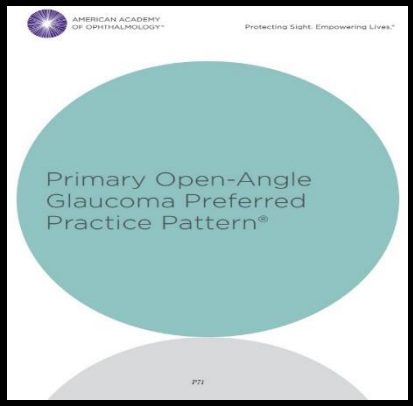
CLINICAL FINDINGS CHARACTERISTIC OF POAG

- OPTIC DISC STRUCTURAL ABNORMALITIES
- RETINAL NERVE FIBER LAYER STRUCTURAL ABNORMALITIES
- RELIABLE AND REPRODUCIBLE VISUAL FIELD ABNORMALITY



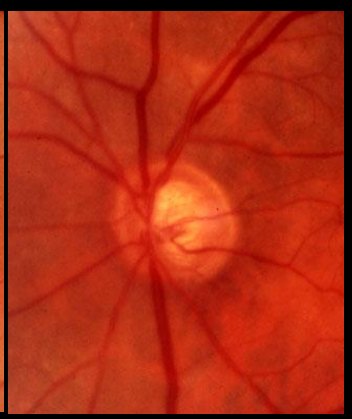
OPTIC DISC STRUCTURAL ABNORMALITIES

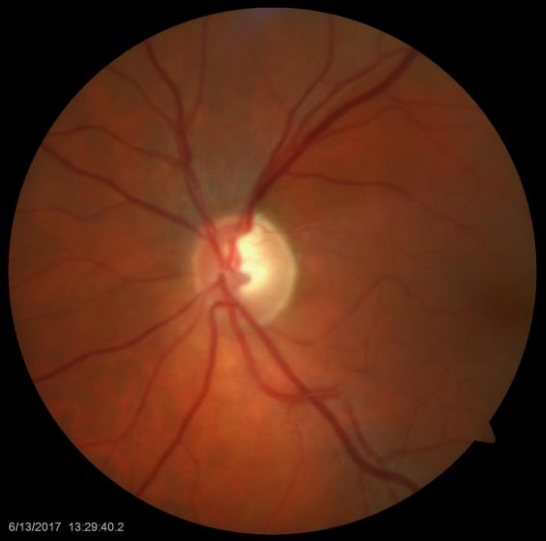
- DISC RIM CHANGES AT SUPERIOR OR INFERIOR POLES
  - DIFFUSE THINNING OF RIM
  - FOCAL NARROWING OF RIM
  - NOTCHING OF RIM
- PROGRESSIVE NEURORETINAL RIM NARROWING / INCREASED CUPPING
- HEMORRHAGES AT DISC RIM, PERIPAPILLARY RNFL, LAMINA
- OPTIC DISC NEURAL RIM ASYMMETRY OF THE TWO EYES
  - CONSISTENT WITH LOSS OF NEURAL TISSUE
- LARGE EXTENT OF PARAPAPILLARY ATROPHY



CLINICAL OPTIC NERVE EVALUATION FOR SUSPECTING GLAUCOMA

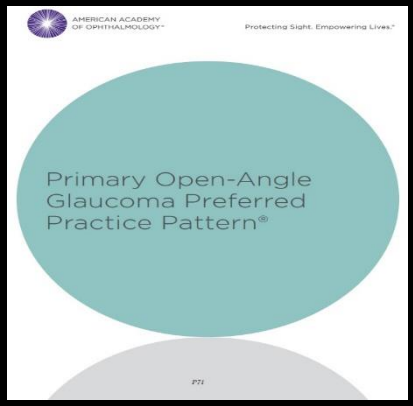
- GLAUCOMATOUS ONH SIGNS
  - VERTICAL ELONGATION
  - DIFFUSE RIM LOSS
  - RIM NOTCH
  - PARAPAPILLARY ATROPHY
  - DISC HEMORRHAGES
  - PROGRESSIVE CHANGE
  - EXCAVATION OF THE CUP
  - C/D ASYMMETRY > 0.2
  - ACQUIRED ONH PIT
  - NERVE FIBER LAYER DEFECTS
  - NASALIZATION OF CUP
  - BARING OF THE CIRCUMLINEAR VESSEL
  - ABSENCE OF NEURORETINAL RIM PALLOR



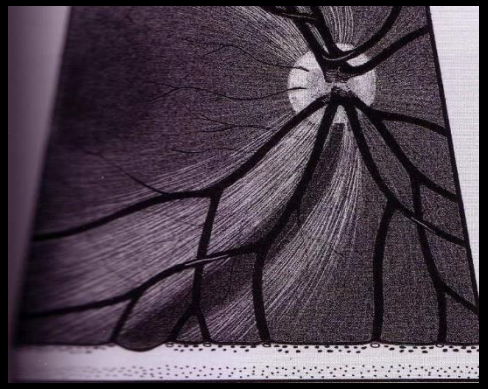
RETINAL NERVE FIBER LAYER STRUCTURAL ABNORMALITIES

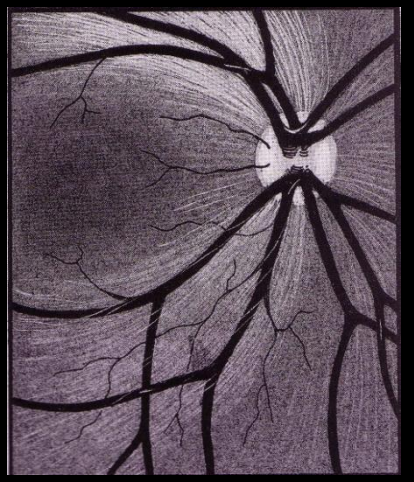
- ABNORMALITIES OF PARAPAPILLARY RNFL
  - DIFFUSE OR LOCALIZED
  - ESPECIALLY AT SUPERIOR / INFERIOR POLES

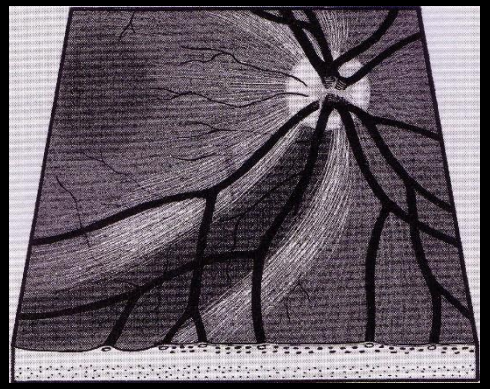


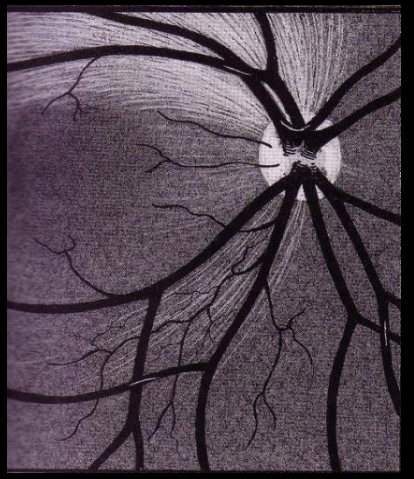
CLINICAL RNFL EVALUATION FOR SUSPECTING GLAUCOMA

- RNFL SLIT DEFECT
  - EVIDENCE OF FOCAL DAMAGE
  - LARGER THAN ARTERIOLE WIDTH
  - TRAVELS ALL THE WAY TO ONH
- RNFL WEDGE DEFECT
  - EASIEST TO IDENTIFY LEAST COMMON
  - EXPANDING LOSS OF GANGLION CELLS
  - ASSOCIATED NOTCH, VF DEFECT, AFTER DISC HEME
- DIFFUSE RNFL LOSS
  - MOST COMMON
  - HARDEST TO IDENTIFY
  - LOSS OF STRIATIONS IN THE SUPERIOR AND INFERIOR ARCUATE BUNDLES
  - RAKED OR THINNED APPEARANCE
  - STRIATIONS ARE LESS BRIGHT
  - TEXTURE IS FINER
  - TERTIARY VESSELS ARE VISIBLE
  - COMPARE SUPERIOR TO INFERIOR
  - COMPARE RIGHT TO LEFT EYE









The Glaucoma Handbook. AB Litwak. Butterworth-Heinemann. 2000.

MY OCT GUIDE FOR SUSPECTING GLAUCOMA

(IF YOU THINK THE CLINICAL ONH / RNFL LOOKS SUSPICIOUS…)

USING THE CIRRUS FOR THE ONH and RNFL

(COMPILED FROM VARIOUS ARTICLES)

Vertical C/D or ONH Rim Area outside 95% CI (yellow <5% or red <1%)

OR

Average thickness outside 95% CI (yellow <5% or red <1%)

OR

1 quadrant (sup / inf) outside 95% CI (yellow <5% or red <1%)

OR

2 clock hours (not directly temporal, nothing nasal) outside 95% CI (yellow <5% or red <1%)

OR

Asymmetry between the R / L eyes' average thickness / quad / clock hr / sector > 9 um

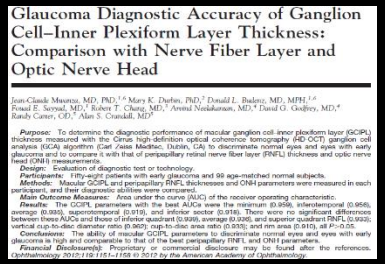
(Information can be loosely applied to Spectralis. I am unsure about other devices)

2 clock hours =1 Spectralis sector

- BE AWARE OF
  - RED DISEASE (FALSE POSITIVES)
    - SIGNAL / SCAN ERRORS, MEDIA OPACITIES / BLOCKING, OTHER DISORDERS
  - GREEN DISEASE (FALSE NEGATIVES)
    - LOOK FOR ASYMMETRY BETWEEN AVG / QUADS / SECTORS / CLOCK
  - OTHER THINGS CAN CAUSE RNFL LOSS
    - ANY RETINOPATHY, ANY RETINAL ABNORMALITY, ANY OPTIC NEUROPATHY, SYSTEMIC DISEASES

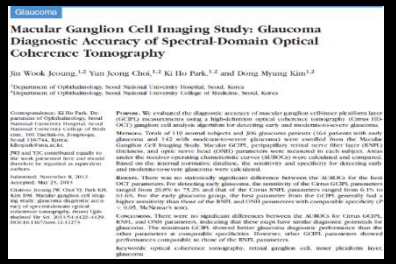
GUIDE FOR SUSPECTING GLAUCOMA USING THE CIRRUS / SPECTRALIS FOR GCC

- GLAUCOMA INITIALLY DAMAGES TEMPORAL SIDE OF GANGLION CELL BODIES IN MACULA
  - ASYMMETRICALLY DAMAGES BETWEEN SUPERIOR / INFERIOR GANGLION CELL BODIES
    - "SQUEEGEE OR NAUTILUS SIGN"
  - CIRRUS
  - MINIMUM OR INFEROTEMPORAL
    - BEST PERFORMANCE (2013 study)
    - BEST PERFORMANCE (2012 study)
  - RESULTS NOT APPLICABLE TO PATIENTS WITH CONCURRENT MACULAR DISEASE
    - AMD, CSME/DME, CME, ERM, ETC
- SPECTRALIS
  - COMPARISON
    - SUPERIOR TO INFERIOR, OD VS OS
  - HIGH DIAGNOSTIC SENSITIVITY (83.3%) AND SPECIFICITY (92.6%) WHEN USING 3 CONSECUTIVE BLACK CELLS TO DETECT GLAUCOMA
  - THE DARKER THE SQUARE, THE LARGER THE DIFFERENCE IN THICKNESS BETWEEN OPPPOSITE HEMISPHERES OR OPPOSITE EYES


Glaucoma Diagnostic Accuracy of Ganglion Cell–Inner Plexiform Layer Thickness: Comparison with Nerve Fiber Layer and Optic Nerve Head

Jean-Claude Mwanza, MD, PhD,[1,6] Mary K. Durbin, PhD,[2] Donald L. Budenz, MD, MPH,[1,6] Fouad E. Sayyad, MD,[1] Robert T. Chang, MD,[3] Aroma Neelakantan, MS,[4] David G. Godfrey, MD,[4] Randy Carter, OD,[5] Alan S. Crandall, MD[1]

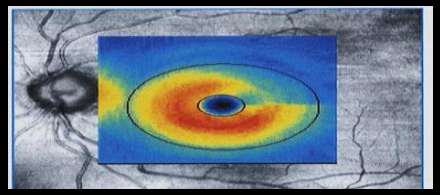
Mwanza JC, Durbin MK, Budenz DJ, et al. Ophthalmology 2012; 119: 1151-1158

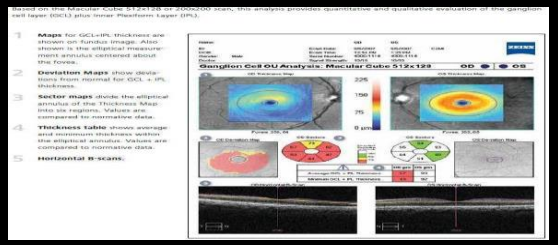

Glaucoma

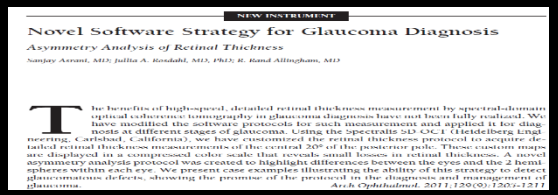
Macular Ganglion Cell Imaging Study: Glaucoma Diagnostic Accuracy of Spectral-Domain Optical Coherence Tomography

Jin Wook Jeoung,[1,2] Yun Jeong Choi,[1,2] Ki Ho Park,[1,2] and Dong Myung Kim[1,2]

Jeoung JW, Choi YJ, Park KH, et al. IOVS 2013; 54: 4422-4429






NEW INSTRUMENT

Novel Software Strategy for Glaucoma Diagnosis

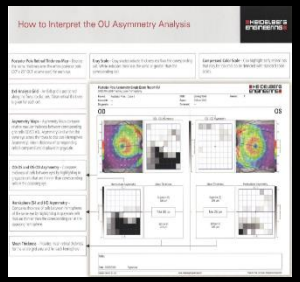
Asymmetry Analysis of Retinal Thickness

Sanjay Asrani, MD; Julia A. Rosdahl, MD, PhD; R. Rand Allingham, MD

The benefits of high-speed, detailed retinal thickness measurement by spectral-domain optical coherence tomography in glaucoma diagnosis have not been fully realized. We have modified the software protocols for such measurement and applied it for diagnosis at different stages of glaucoma. Using the spectralis SLO/OCT (Heidelberg Engineering, Carlsbad, California), we have customized the retinal thickness protocol to acquire detailed thickness measurements of the central 20° of the posterior pole. These custom maps are displayed in a compressed color scale that reveals small losses in retinal thickness. A novel asymmetry analysis protocol was created to highlight differences between the eyes and the 2 hemispheres within each eye. We present case examples illustrating the ability of this strategy to detect glaucomatous defects, showing the promise of the protocol in the diagnosis and management of glaucoma.

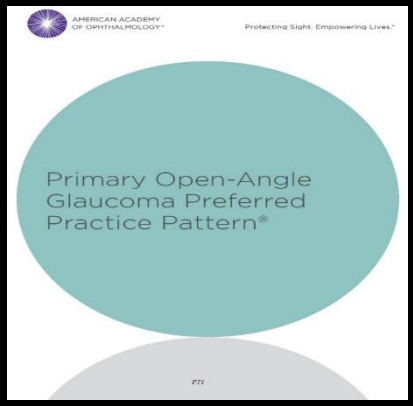
Arch Ophthalmol. 2011;129(9):1205-1211

Asrani S, Rosdahl, JA, Allingham RR. Arch Ophthal, Vol 129 (9), Sept 2011: 1205-11


How to Interpret the OU Asymmetry Analysis

RELIABLE AND REPRODUCIBLE VISUAL FIELD ABNORMALITY

- CONSISTENT WITH RETINAL NERVE FIBER LAYER DAMAGE
  - NASAL STEP
  - ARCUATE DEFECT
  - PARACENTRAL DEPRESSION IN CLUSTERS OF TEST SITES
- VISUAL FIELD LOSS ACROSS HORIZONTAL MIDLINE IN ONE HEMIFIELD EXCEEDS LOSS IN THE OPPPOSITE HEMIFELD (IN EARLY / MODERATE CASES)
- ABSENCE OF OTHER EXPLANATIONS

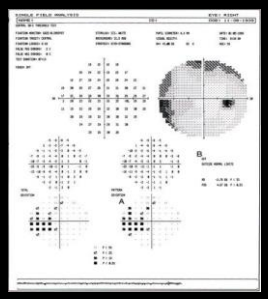


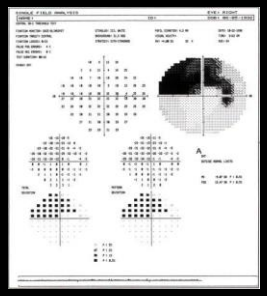
GLAUCOMATOUS VISUAL FIELDS

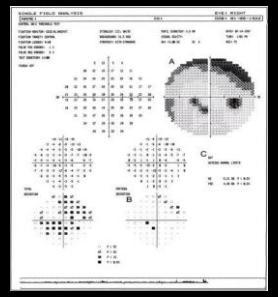
- VF LOSS = MODERATE OR SEVERE DAMAGE
- EARLY IN DISEASE
  - BASELINE VF
  - FOLLOW OPTIC NERVE / RNFL FOR CHANGES
- LATE IN DISEASE
  - FOLLOW VISUAL FIELD FOR CHANGES
    - MAY HAVE TO CONSIDER 10-2 OR MACULA VF
    - SIZE V TARGET 24-2 OR 10-2
    - ESTERMAN FOR DRIVING
    - KINETIC III4e FOR LEGAL BLINDNESS
- IS IT GLAUCOMATOUS?
  - OBVIOUS DEFECTS
    - THE NASAL STEP
    - THE ARCUATE DEFECT
    - THE PARACENTRAL / CENTRAL DEFECT
  - DIFFUSE VISUAL FIELD LOSS ?
    - TYPICALLY NOT GLAUCOMA
- EARLIEST DEFECTS COULD BE
  - CENTRAL, MID-PERIPHERAL, PERIPHERAL

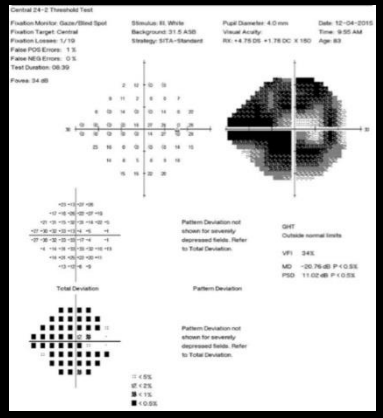
REMEMBER:

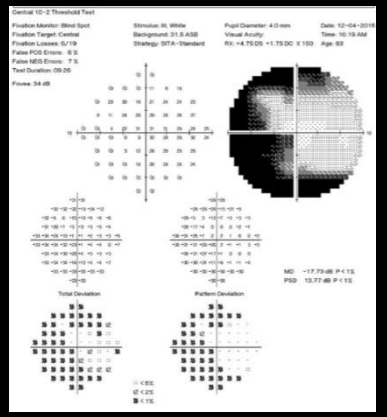
- RARE BUT FUNCTIONAL DAMAGE MAY PRECEDE STRUCTURAL DAMAGE
- VISUAL FIELD MUST MATCH THE OPTIC NERVE / RNFL / GCC











24-2 VS 10-2 OF THE SAME PATIENT

MINIMUM DIAGNOSTIC CRITERIA FOR A GLAUCOMATOUS VISUAL FIELD

- IN THE ABSENCE OF OTHER CAUSES FOR FIELD ABNORMALITY AND IN THE PRESENCE OF SUSPICION FOR GLAUCOMA
  - CLINICAL DECISIONS IN GLAUCOMA, 2ND EDITION

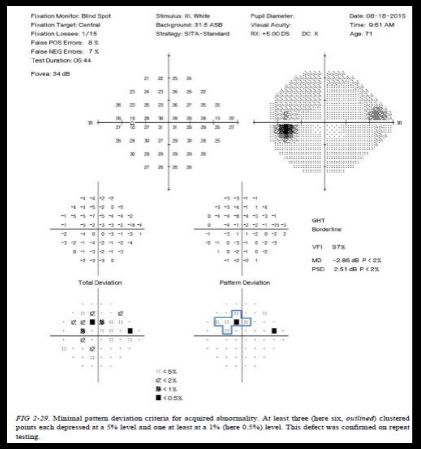


FIG 2-29. Minimal pattern deviation criteria for acquired abnormality. At least three (here six, *outlined*) clustered points each depressed at a 5% level and one at least at a 1% (here 0.5%) level. This defect was confirmed on repeat testing.

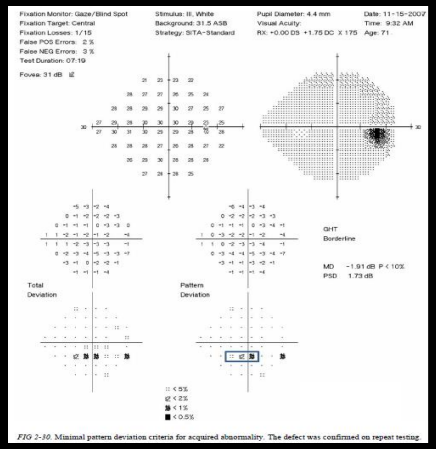


FIG 2-30. Minimal pattern deviation criteria for acquired abnormality. The defect was confirmed on repeat testing.

- TWO "OUTSIDE NORMAL LIMITS" ON GHT
  - CLINICAL DECISIONS IN GLAUCOMA, 2ND EDITION

OR

- CLUSTER OF THREE OR MORE POINTS IN A LOCATION TYPICAL FOR GLAUCOMA, ALL DEPRESSED ON PATTERN DEVIATION PLOT AT A P < 5% AND ONE DEPRESSED AT A P < 1% ON TWO CONSECUTIVE FIELDS (24-2 COUNTS EDGE POINTS, 30-2 ONLY COUNTS 2 NASAL PTS), ALL PTS RESPECT HORIZONTAL MERIDIAN
  - KATZ, ET AL. ARCH OPHTHAL 1991.
  - CLINICAL DECISIONS IN GLAUCOMA, 2ND EDITION

OR

- PSD P < 5% (SUMMARIZES EXTENT OF LOCALIZED LOSS, NOT AFFECTED BY GENERALIZED DEPRESSION)
  - - CLINICAL DECISIONS IN GLAUCOMA, 2ND EDITION
- IF REPEATABLE
  - BUDENZ D. AFRICAN GLAUCOMA SUMMIT. 8/06/10

WHAT MEETS THE MINIMUM CRITERIA?

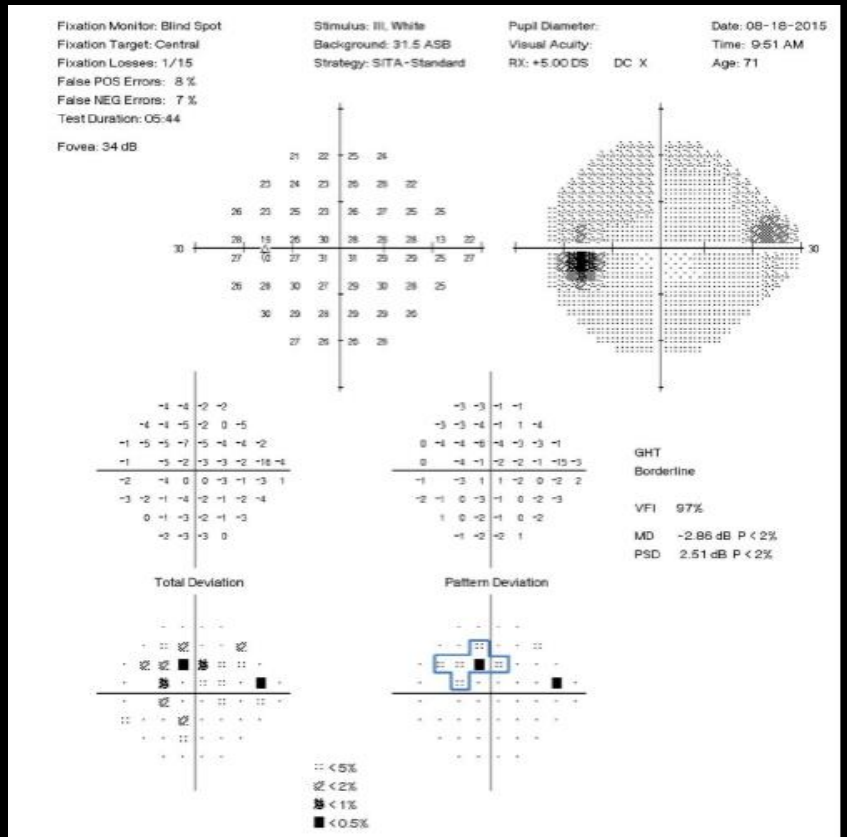


FIG 2-29. Minimal pattern deviation criteria for acquired abnormality. At least three (here six, *outlined*) clustered points each depressed at a 5% level and one at least at a 1% (here 0.5%) level. This defect was confirmed on repeat testing.

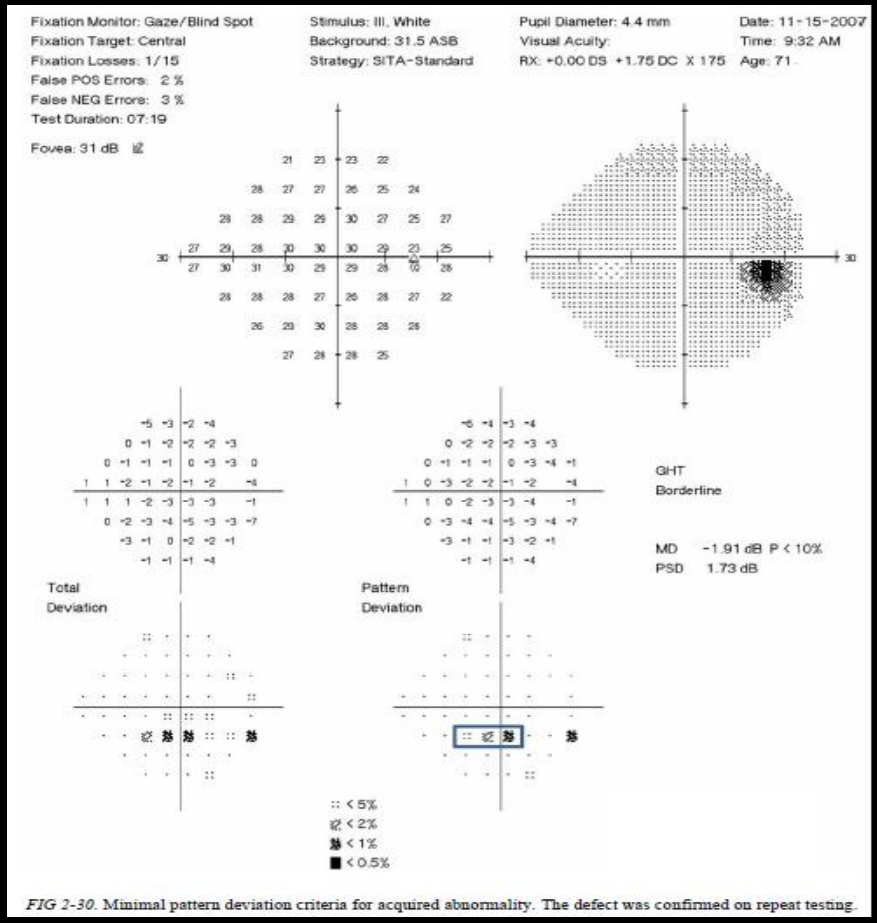


FIG 2-30. Minimal pattern deviation criteria for acquired abnormality. The defect was confirmed on repeat testing.

THE VF DEFECT STILL MUST CORRELATE WITH
THE OPTIC NERVE APPEARANCE AND RNFL APPEARANCE / OCT

REMINDER

- EACH PATIENT IS DIFFERENT
- ALL RESULTS SHOULD MAKE SENSE AND CORRELATE
  - ONH
  - CLINICAL RNFL / OCT RNFL SCAN
  - GANGLION CELL SCAN
  - VISUAL FIELD
    - 24-2 / 10-2

- NO ONE TEST IS SUFFICIENT FOR ALL PATIENTS
  - IF SUSPECTING GLAUCOMA YOU NEED TO HAVE EVALUATED / DOCUMENTED
    - OPTIC NERVE
    - RETINAL NERVE FIBER LAYER
    - GANGLION CELLS
    - VISUAL FIELD

- REGARDLESS OF YOUR OPINION OF THE DATABASES OR LACK THEREOF…
  - YOU CAN NOW MONITOR YOUR PATIENT FOR CHANGE

HOW TO CLASSIFY POAG?

OLD DETAILED vs NEW (AGS / AAO PPP)

MD

0 TO -6

-6 TO -12

-12 and/or central

Minimum criteria for diagnosing acquired glaucomatous damage

A Glaucoma Hemifield Test outside normal limits on at least two fields; OR

A cluster of three or more non-edge points in a location typical for glaucoma, all of which are depressed on the pattern deviation plot at a $p<5\%$ level and one of which is depressed at a $p<1\%$ level on two consecutive fields; OR

A corrected pattern standard deviation that occurs in less than 5% of normal fields on two consecutive fields

Classification of defects

Early defect:

- MD less than -6 dB
- Less than 25% of the points (18) are depressed below the 5% level and less than 10 points are depressed below the 1% level on the pattern deviation plot
- All point in the central 5° must have a sensitivity of at least 15 dB

Moderate defect:

- MD less than -12 dB
- Less than 50% of the points (37) are depressed below the 5% level and less than 20 points are depressed below the 1% level on the pattern deviation plot,
- No points in the central 5° can have a sensitivity of 0 dB
- Only one hemifield may have a point with sensitivity of <15 dB within 5°of fixation

Severe defect (any of the following results):

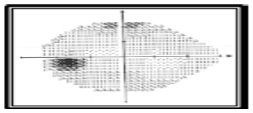
- MD greater than -12 dB
- More than 50% of the points (37) are depressed below the 5% level or more than 20 points are depressed below the 1% level on the pattern deviation plot
- At least one point in the central 5° has a sensitivity of 0 dB
- Points within the central 5° with sensitivity <15 dB in both hemifields

Hoddap –Parrish –Anderson criteria.

Mild or Early Stage Glaucoma

ICD-9 365.71; ICD-10 7th digit "1"

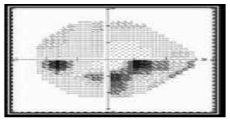
- Optic Nerve abnormalities consistent with glaucoma
- but NO visual field abnormalities on any visual field test
- OR abnormalities present only on short-wave-length automated perimetry or frequency doubling perimetry



Moderate Stage Glaucoma

ICD-9 365.72; ICD-10 7th digit "2"

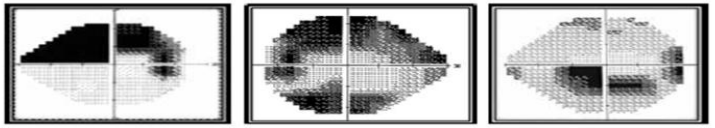
- Optic nerve abnormalities consistent with glaucoma
- AND glaucomatous visual field abnormalities in ONE hemifield and
- NOT within 5 degrees of fixation (note: 5 degrees = involvement of spots nearest fixation)



Advanced, Late, Severe Stage

ICD-9 365.73; ICD-10 7th digit "3"

- Optic nerve abnormalities consistent with glaucoma
- AND glaucomatous visual field abnormalities in BOTH hemifields
- AND/OR loss within 5 degrees of fixation in at least one hemifield.



- IN PRESENCE OF A GLAUCOMATOUS OPTIC NERVE AND/OR CLINICAL RNFL / OCT RNFL OR OCT GCC
- IF ONH / OCT APPEAR WORSE THAN VISUAL FIELD…GRADE UP ON SEVERITY

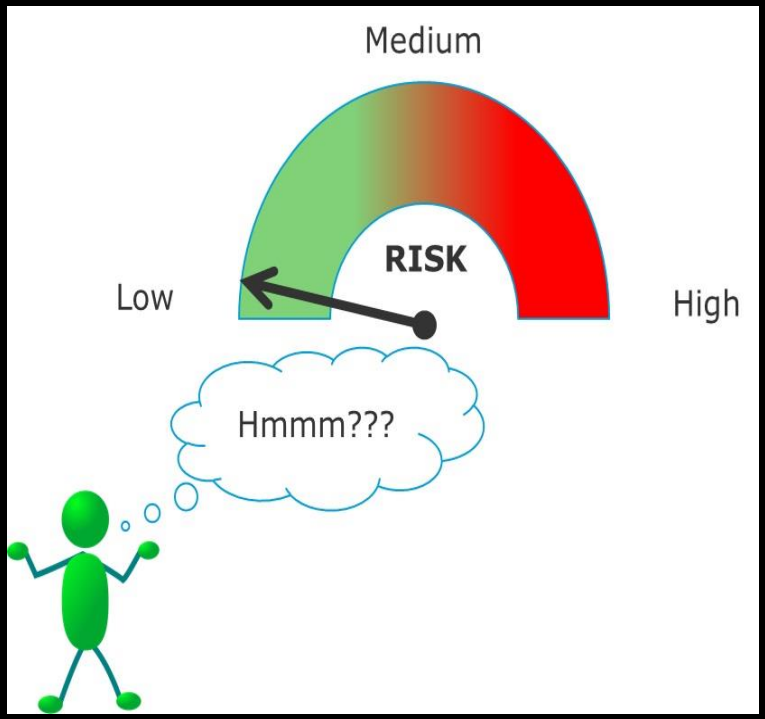
NEED TO KNOW

- CLINICAL SIGNS
  - ONH, RNFL / OCT, VF
- TESTING REQUIRED
  - PACHYM, PHOTOS, GONIO, ORA
  - OCT RNFL / GCC, VF
- POAG VS SECONDARY
  - STAGES (MILD, MOD, SEVERE) / FOLLOW-UP
- PATIENT EDUCATION
  - REVIEWED GLAUCOMA
  - RECOMMENDATIONS
    - MONITOR VS TREATMENT
      - LOWER IOP BY MEDS / LASER / SURGERY
    - MUST COME BACK
  - NEED FOR 100% COMPLIANCE WITH MEDS/APPTS TO MONITOR FOR CHANGE DUE TO RISK OF ONH DAMAGE / VF LOSS / BLINDNESS IF NOT

- TREATMENT
  - TOPICAL IOP LOWERING AGENTS
    - GENERICS, NAME BRANDS, EFFICACY, DOSING, OCULAR SIDE EFFECTS, SYSTEMIC SIDE EFFECTS, CONTRAINDICATIONS
    - KNOW THE NEW ONES AND VA SPECIFIC
    - KNOW THE BOTTLE SIZES !
  - ORAL IOP LOWERING AGENTS
    - GENERICS, NAME BRANDS, SYSTEMIC SIDE EFFECTS, CONTRAINDICATIONS
  - LASER
    - ALT / SLT
      - MECHANISM, EFFICACY, SIDE EFFECTS, CONTRAINDICATIONS
  - SURGERY
    - TRABECULECTOMY
    - TUBE / SHUNT / GLAUCOMA DRAINAGE DEVICE
    - MIGS OPTIONS WITH / WITHOUT CE/IOL
    - CYCLODESTRUCTION, MICROPULSE
    - EXPRESS SHUNT
    - ETC.

WHY DO WE CLASSIFY?

- ALLOWS YOU TO ASSESS RISK
  - RISK OF PROGRESSION
  - RISK OF VISION LOSS
- DETERMINES
  - MONITORING / FOLLOW-UP INTERVAL
  - NEED FOR REFERRAL / TREATMENT
  - PATIENT EDUCATION
- PROPER CODING AND BILLING



AS OF 6/21/23

- AMD
  - NONEXUDATIVE (DRY)
    - EARLY
    - INTERMEDIATE
    - ADVANCED
      - NONSUBFOVEAL
      - SUBFOVEAL
  - EXUDATIVE (WET)
    - ACTIVE
    - INACTIVE
    - SCAR

- DM RETINOPATHY
  - NONPROLIFERATIVE
    - MILD
    - MODERATE
    - SEVERE
  - PDR
    - WITH / WITHOUT TRACTIONAL RD
  - FOR ALL ABOVE…
    - IS THERE DIABETIC MAC EDEMA?
      - YES / NO
    - PROVIDER WITH OCT DECIDES
      - CENTER INVOLVED
      - NONCENTER INVOLVED

- OPEN-ANGLE GLAUCOMA
  - OC HTN
  - PREGLAUCOMA
  - IF GONIO DONE
    - OAG SUSPECT
      - LOW RISK
      - HIGH RISK
  - POAG / NTG
    - MILD
    - MODERATE
    - SEVERE

THINGS CHANGE. STAY UP TO DATE!