

# RETINOPATHY OF PREMATURITY DO WE HAVE A COMMON CONSENSUS

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# DEFINITION

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## RETINOPATHY OF PREMATURE (ROP)

- ▶ Vision threatening disease in preterm infants due to abnormal vascular development of the retina
- ▶ It occurs in premature babies with low birth weight

**DO WE HAVE COMMON  
CONSENSUS**

**ICROP**

> Arch Ophthalmol. 1984 Aug;102(8):1130-4. doi: 10.1001/archopht.1984.01040030908011.

## An international classification of retinopathy of prematurity. The Committee for the Classification of Retinopathy of Prematurity

> Arch Ophthalmol. 1987 Jul;105(7):906-12.

## An international classification of retinopathy of prematurity. II. The classification of retinal data **Special Article**

Class: July 1, 2005

## Prentice The International Classification of Retinopathy of

## Prentice International Classification of Retinopathy of Prematurity, Third Edition

Classificati

» Author A

Arch Ophth

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# ICROP III 2021

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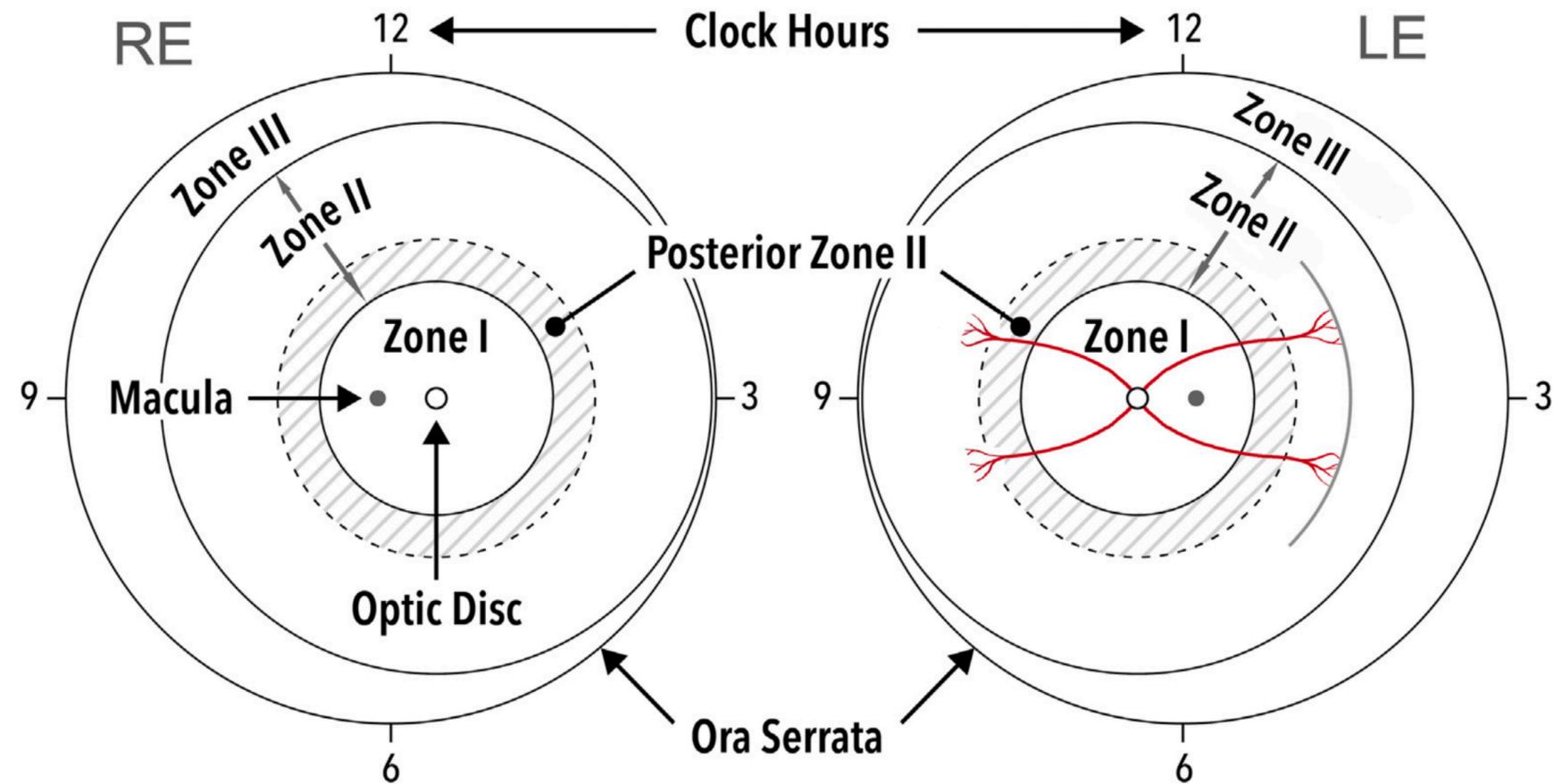
- Critical elements of disease classification
- Innovations in ophthalmic imaging
- Novel pharmacologic therapies with unique regression and reactivation features
- Recognition that patterns of ROP in some regions of the world **do not fit neatly** into the current classification system.

**KEEP UPDATED**

# NOMENCLATURE

# ZONES

Chiang et al • ICROP, 3rd Edition



**Figure 1.** Schema of right eye (RE) and left eye (LE) showing zone borders and clock hour sectors used to describe the location of vascularization and extent of retinopathy. Solid circles represent borders of zones I through III, and dotted circles represent borders of posterior zone II (2 disc diameters beyond zone I). A hypothetical example of examination findings is shown in LE, representing approximately 3 clock hours of stage 1 disease in zone II (note single line on drawing to document presence of stage 1 disease).

# POST ZONE 2

The committee defined a region of 2 DD peripheral to the zone I border as posterior zone II to indicate potentially more worrisome disease than ROP in the more peripheral zone

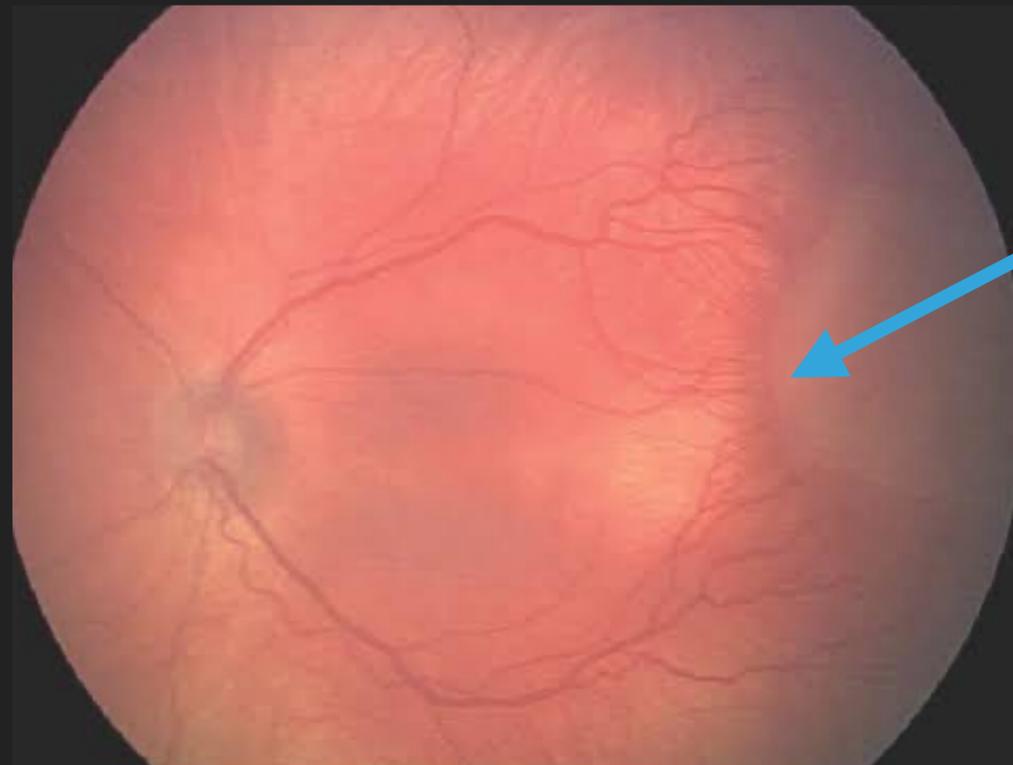
II

## ICROP 3 UPDATES

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### NOTCH

The committee introduced the term **notch** to describe an incursion by the ROP lesion of 1 to 2 clock hours along the horizontal meridian into a more posterior zone than the remainder of the retinopathy.



# ICROP 3 UPDATES

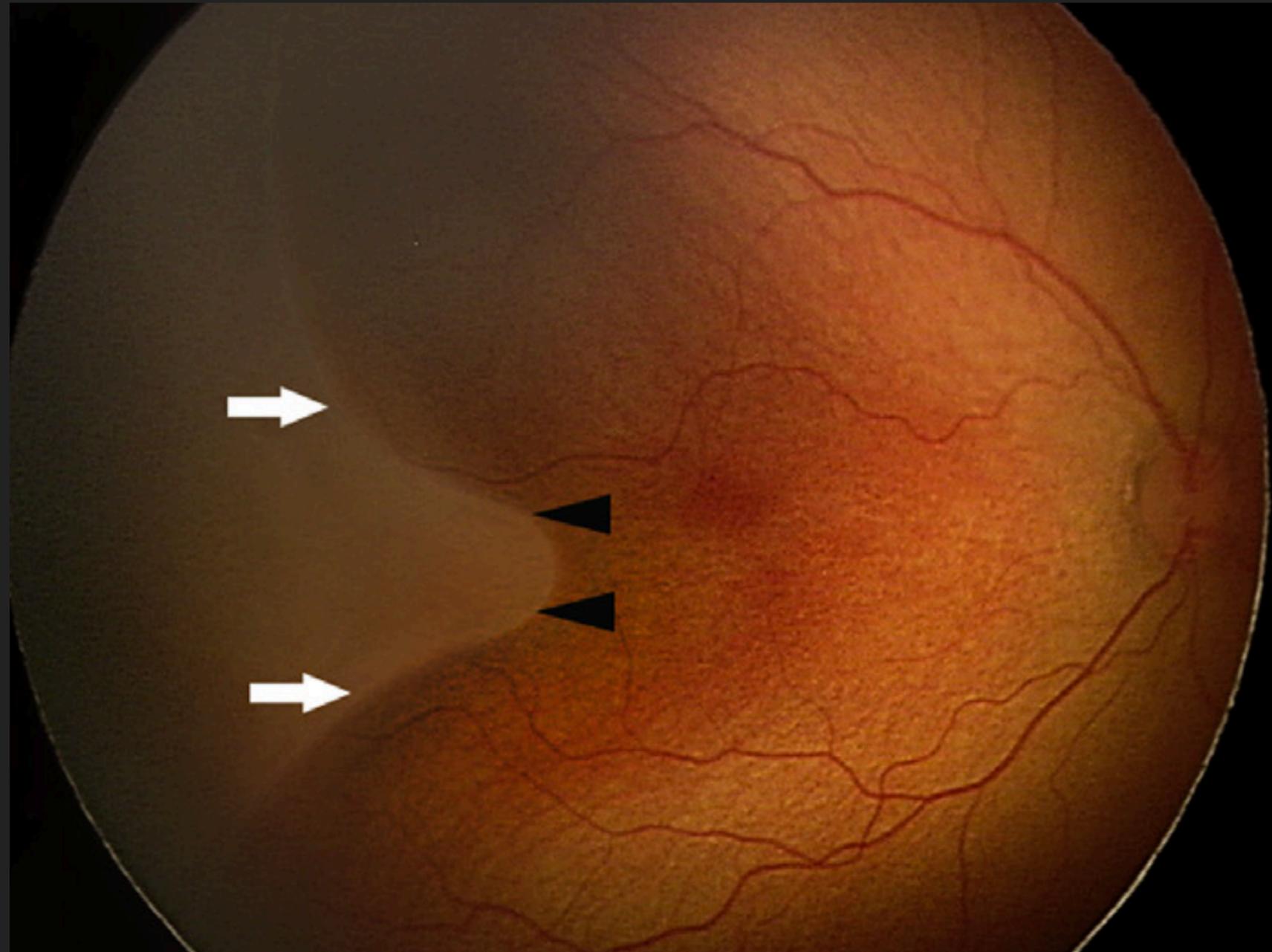
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## NOTCH

- When present, this should be Recorded by the most posterior zone of retinal vascularization with the TERM “secondary to notch”
- For example, ROP in zone II in most places, but with a temporal notch extending into zone I, should be noted as “zone I secondary to notch” thereby distinguishing it from an eye in which most disease is present in zone I.

# ICROP 3 UPDATES

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**“STAGE 1, ZONE 1 SECONDARY TO NOTCH, NO PLUS”**

# ICROP 3 UPDATES

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## PLUS DISEASE

- ICROP I 1984 : definition of **plus** disease was introduced
- In the ICROP II 2005 : definition of **preplus** disease was introduced
- In the ICROP III 2021 : The committee recommends that the plus disease spectrum be determined from vessels within zone I , rather than from only vessels within the field of narrow-angle photographs and rather than from the number of quadrants of abnormality

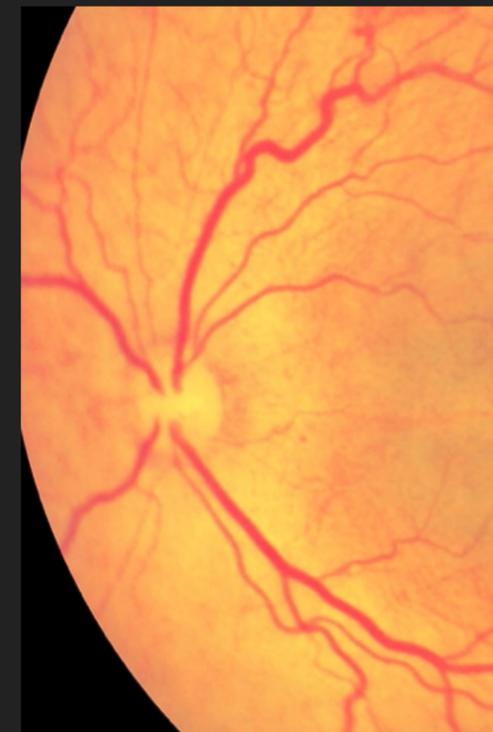
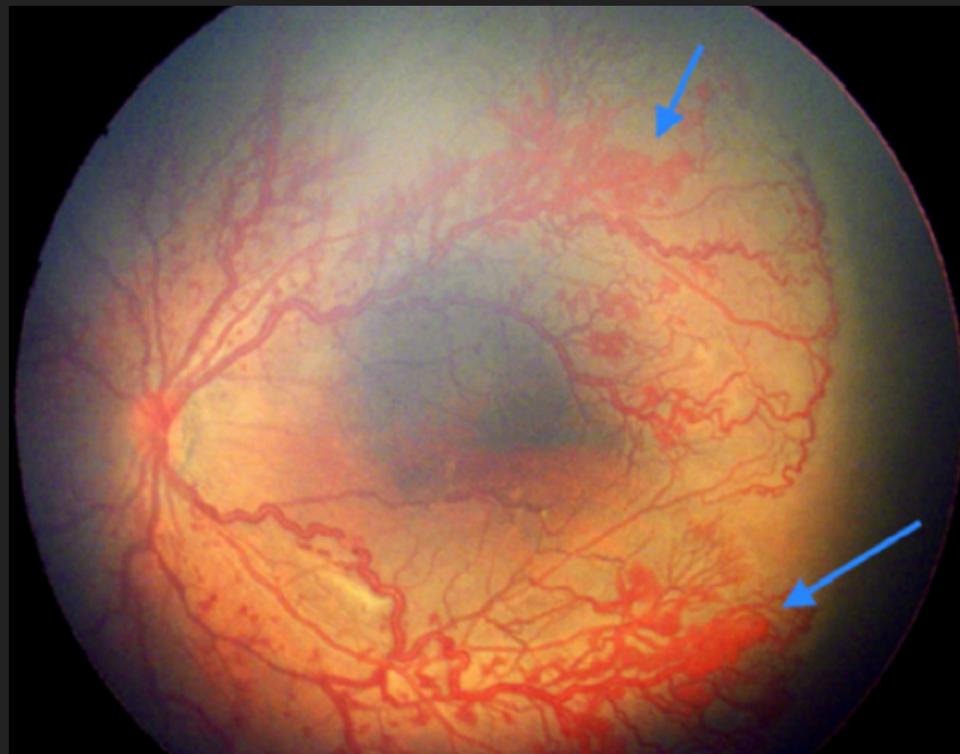


# PRE-PLUS DISEASE CONFUSING

Vascular changes  
that are not normal,  
but are insufficient  
for the diagnosis of  
**plus disease**

# TERM

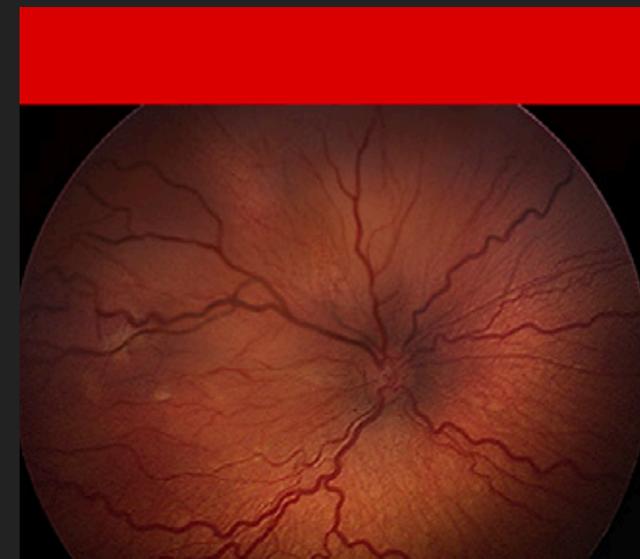
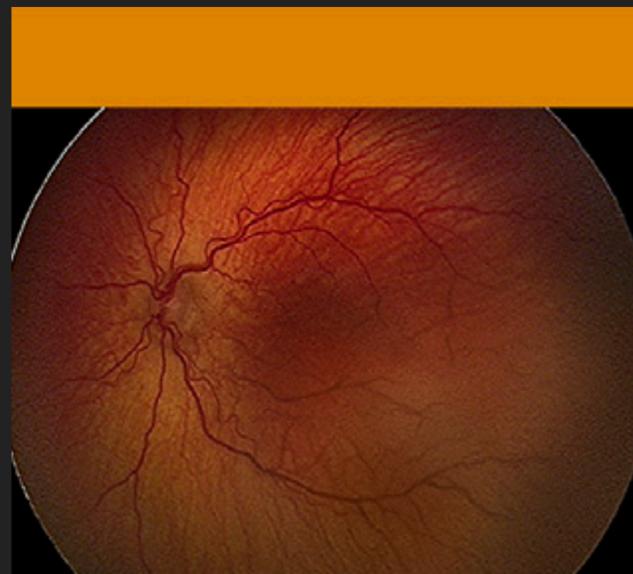
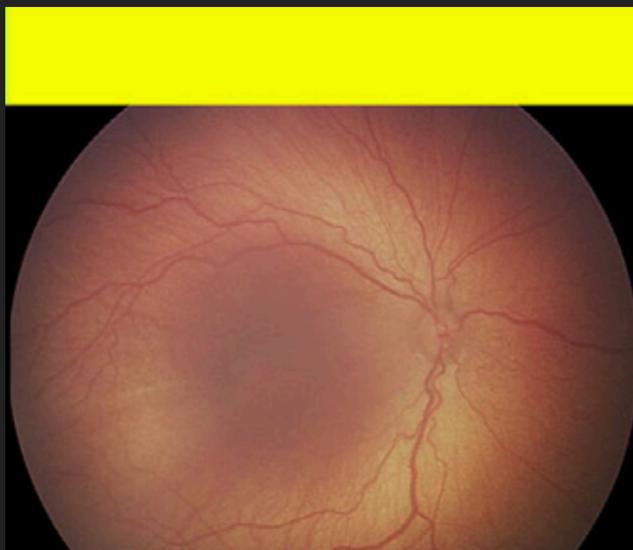
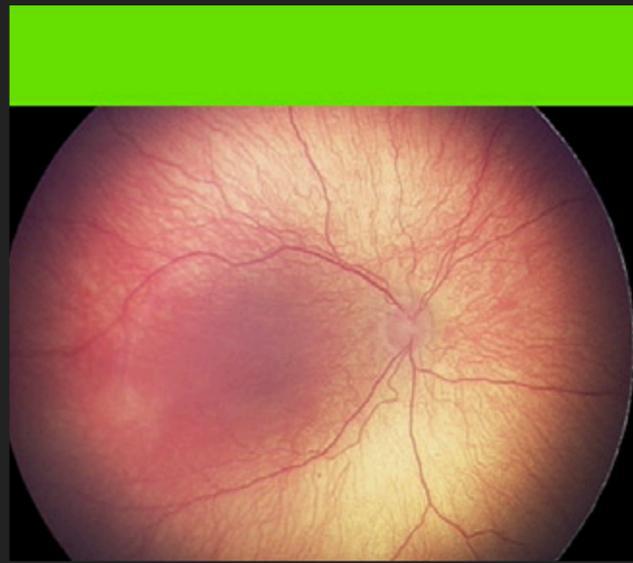
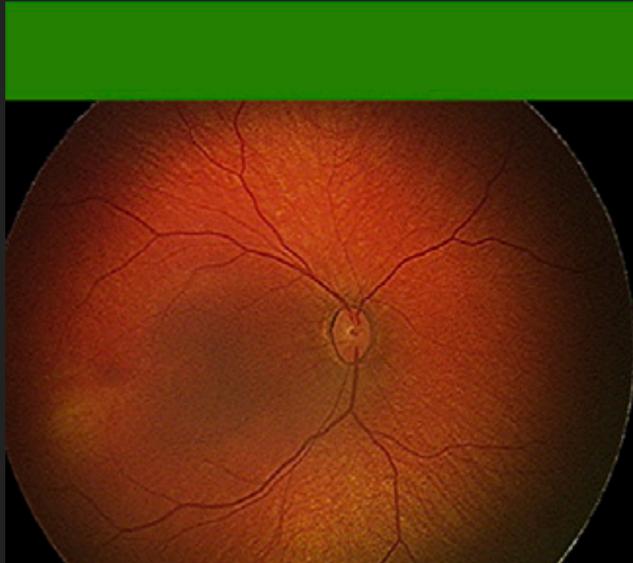
# PLUS DISEASE



# ICROP 3 UPDATES

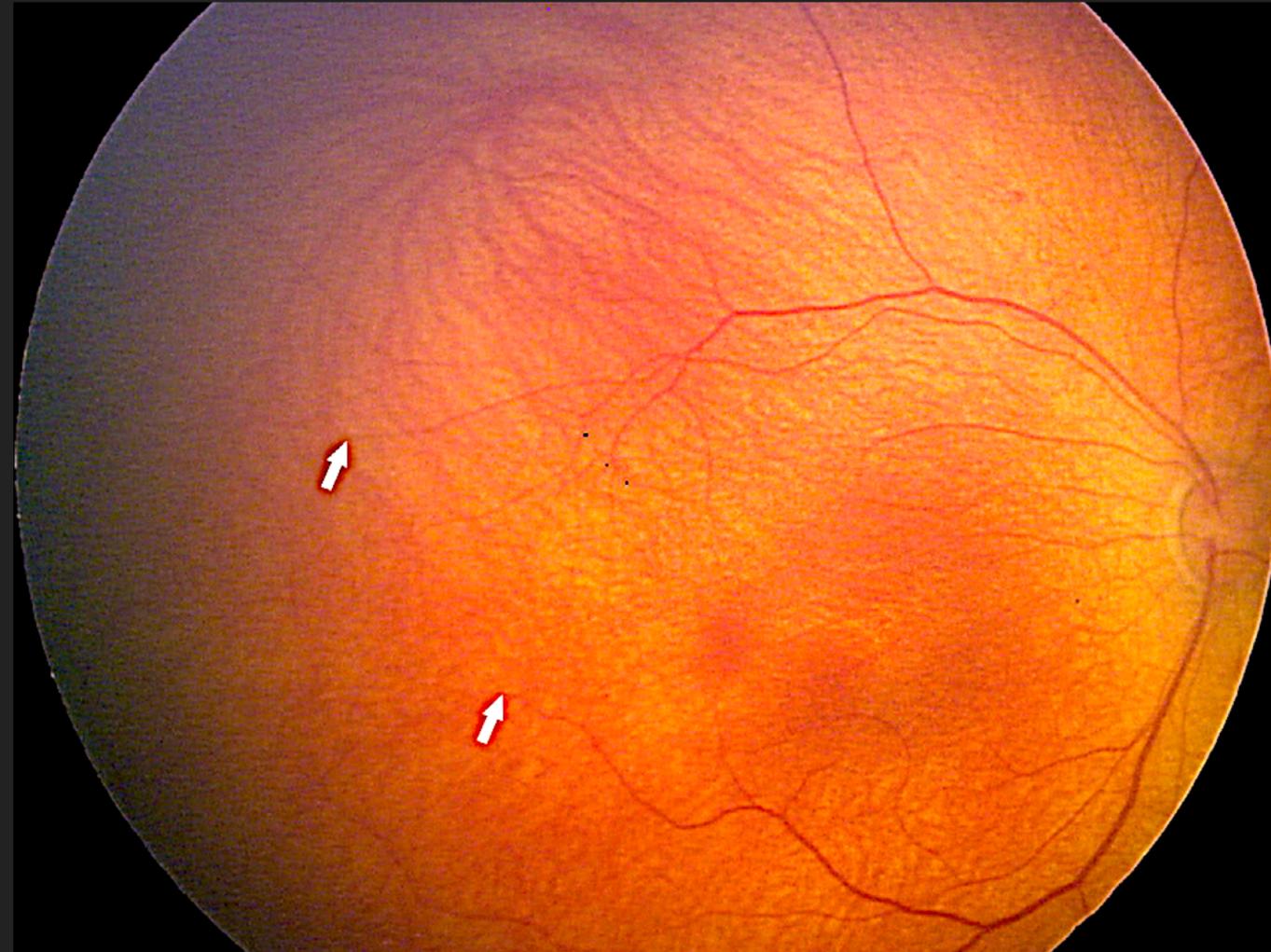
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## PLUS & PRE-PLUS DISEASE RANGE



# CLINICAL PICTURE

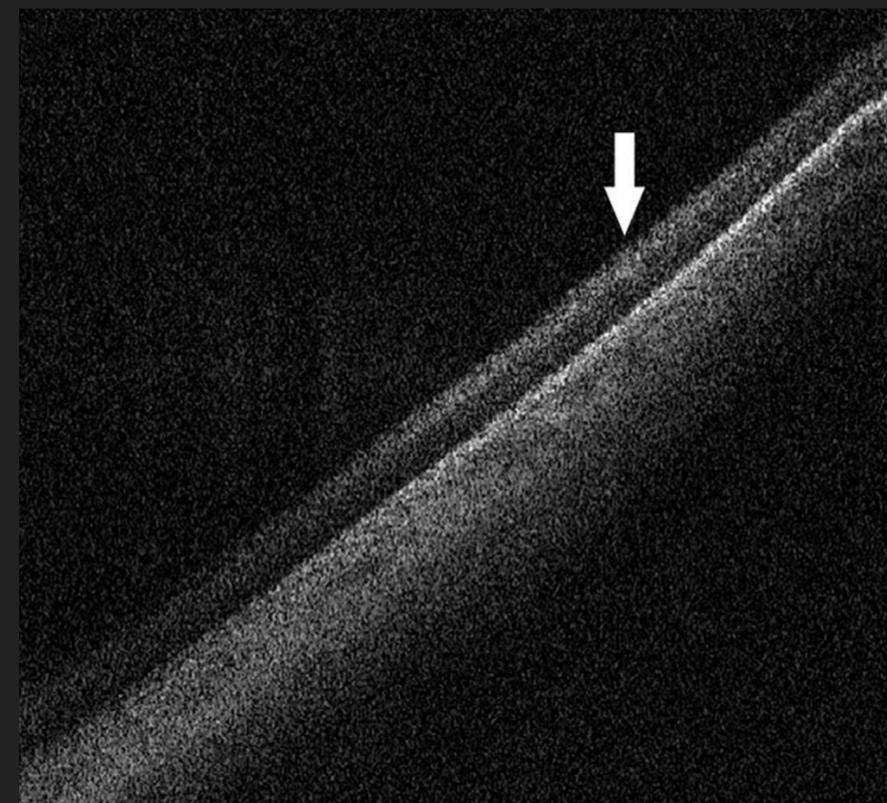
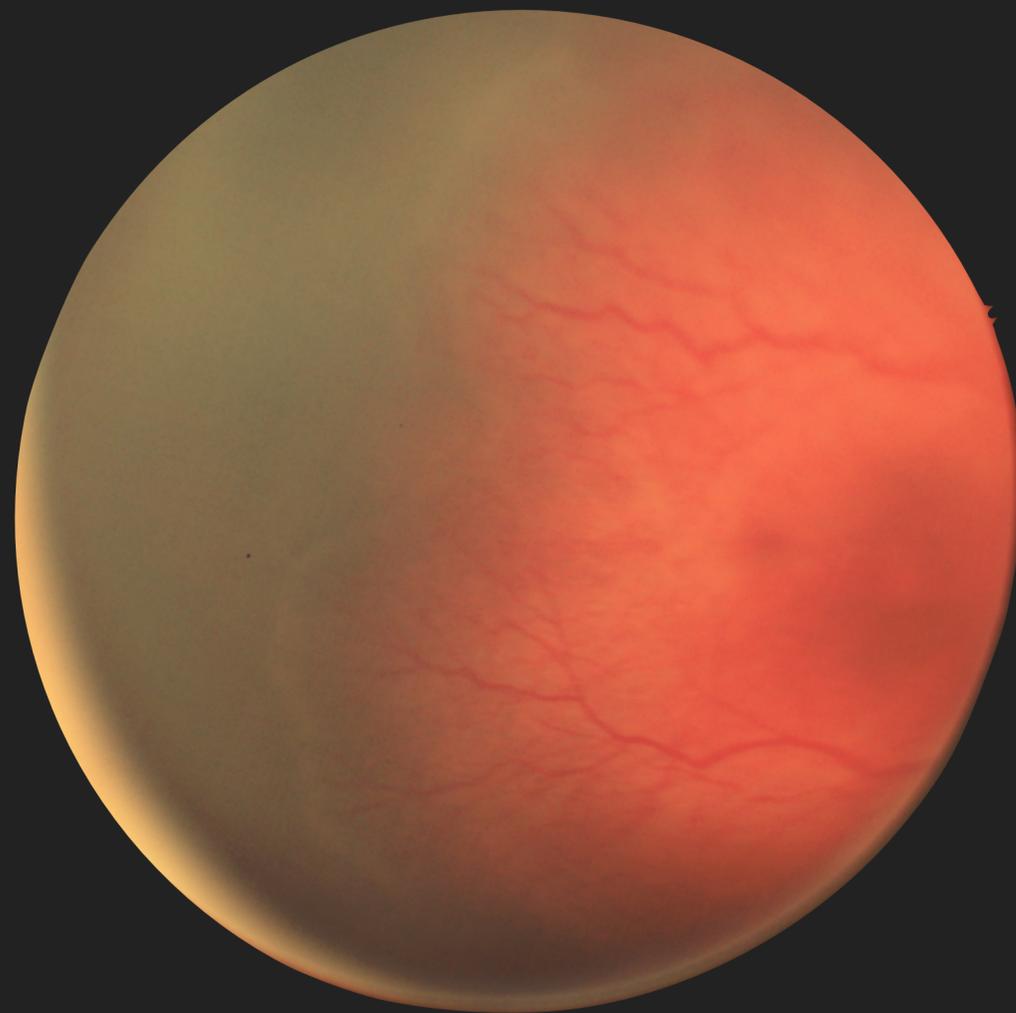
# STAGE ZERO



Stage 0: incomplete  
vascularization

# STAGE 1

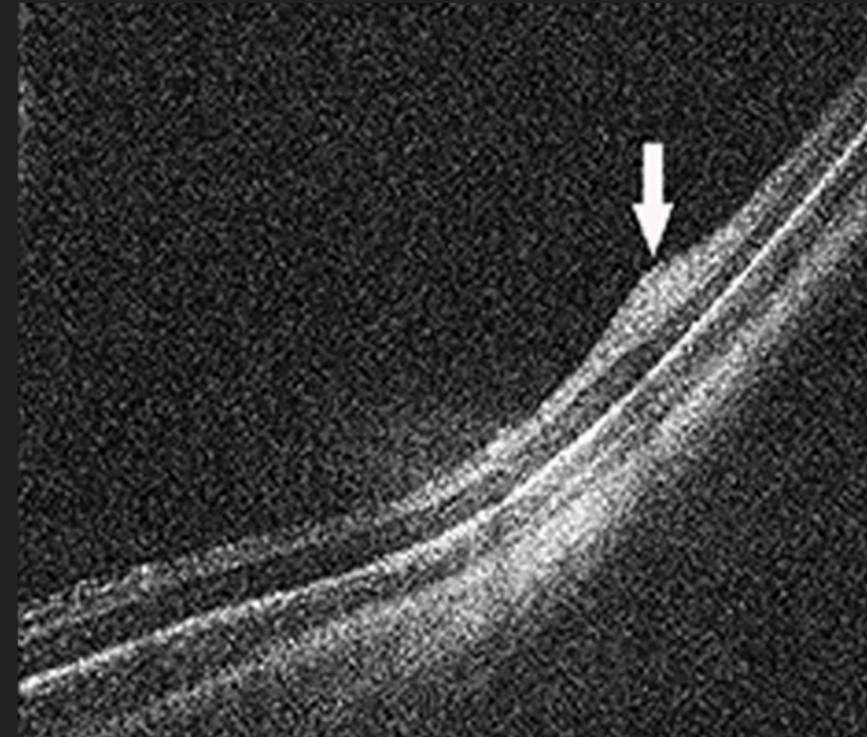
Stage 1: Line



# STAGE 2

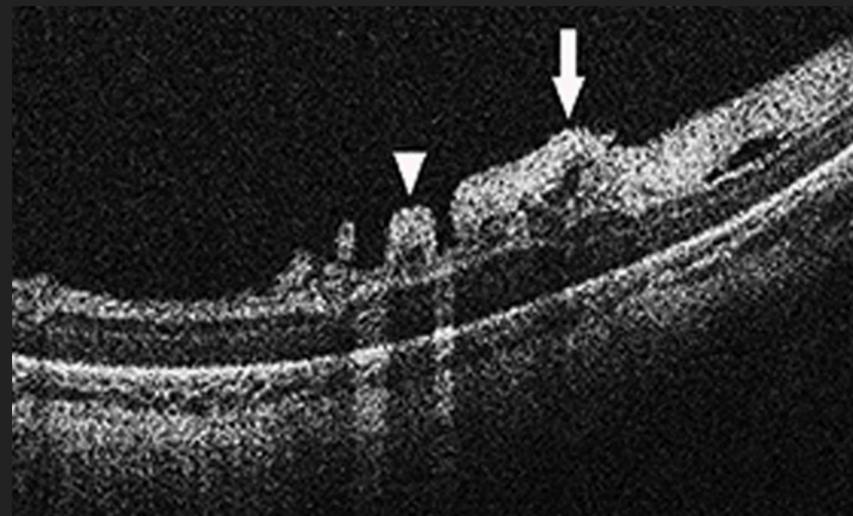


Stage 2: Ridge



# STAGE 3

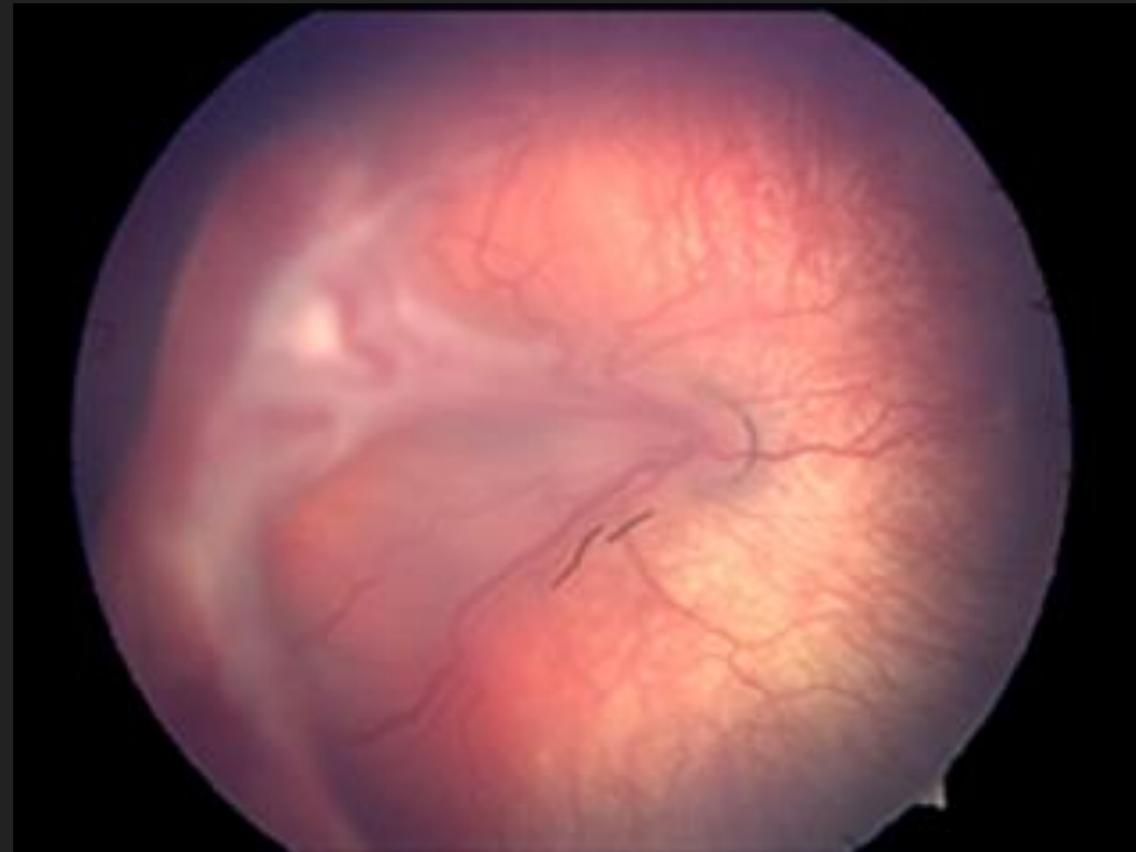
## VASCULARIZED RIDGE (NEOVASCULARIZATION)



# STAGE 4

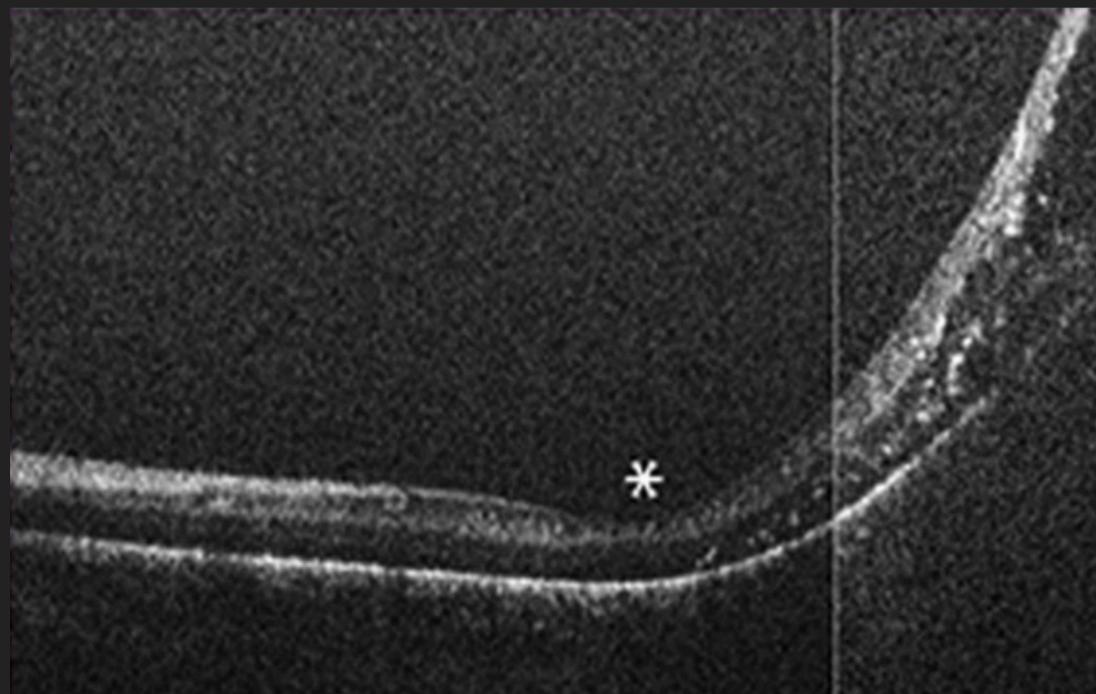


Stage 4a: Partial RD  
macula on

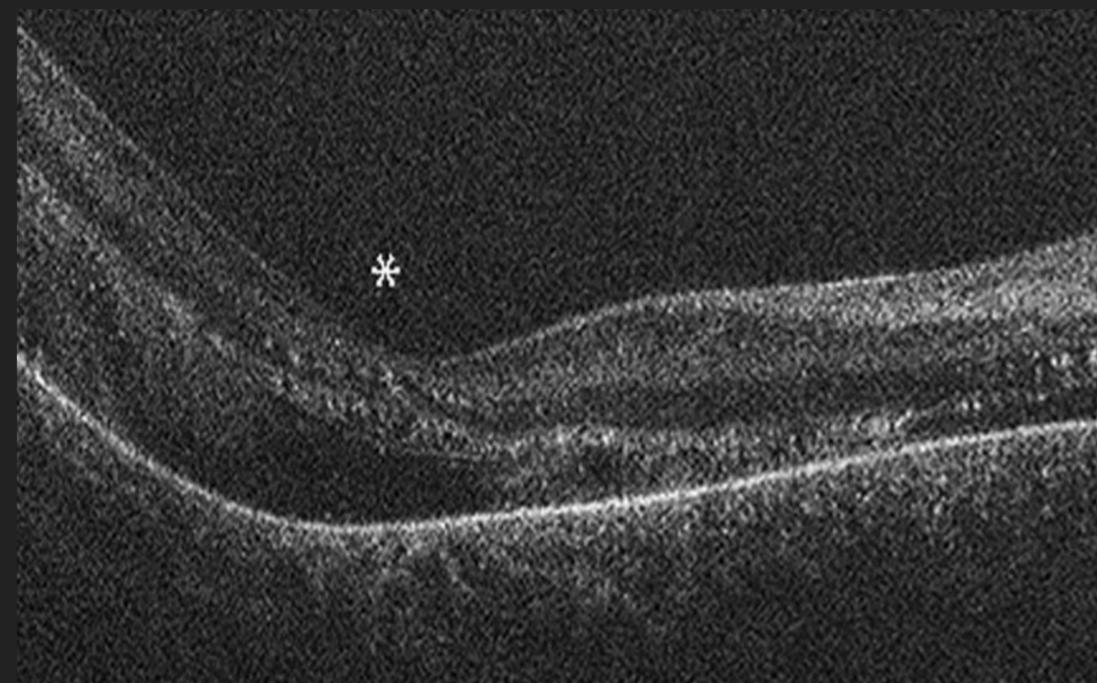


Stage 4b: Partial RD  
macula off

# STAGE 4



Stage 4a: Partial RD  
macula on



Stage 4b: Partial RD  
macula off

# STAGE 5

Stage 5 : Total retinal detachment & was classified by configuration of the funnel

Funnel configuration

Ant. configuration

Post. configuration

**V. DIFFICULT & CONFUSING**

Funnel configuration	Ant. configuration	Post. configuration
Closed-Open	Open anteriorly	Open Posteriorly
Open-Closed	Open anteriorly	Closed Posteriorly
Closed-Open	Closed anteriorly	Open Posteriorly
Closed-Closed	Closed anteriorly	Closed Posteriorly

When fibrosis precludes visualization of the posterior pole, the extent of detachment must be examined by B-scan ultrasonography.

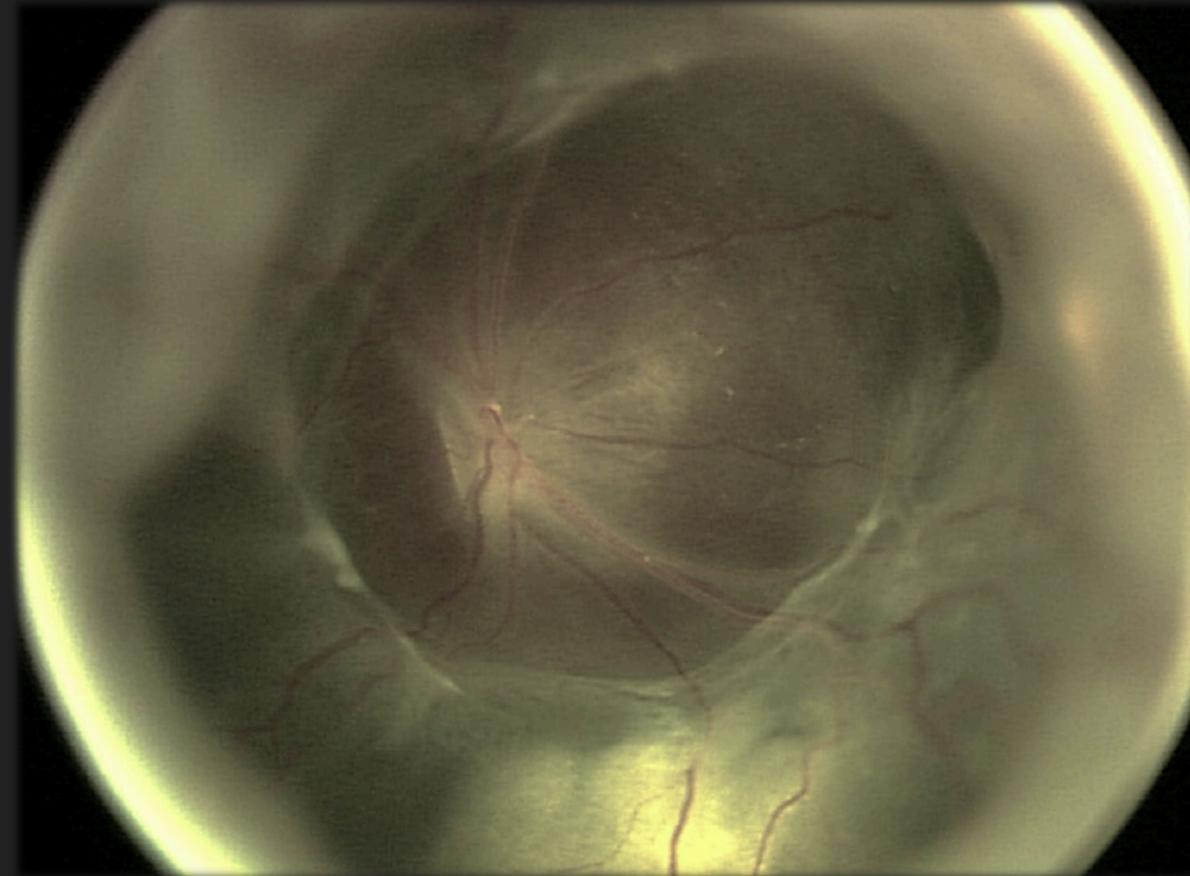
## ICROP 3 UPDATES

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To permit classification of stage 5  
by bedside examination ICROP III  
committee subclassified stage 5  
into **3 subtypes**

# ICROP 3 UPDATES

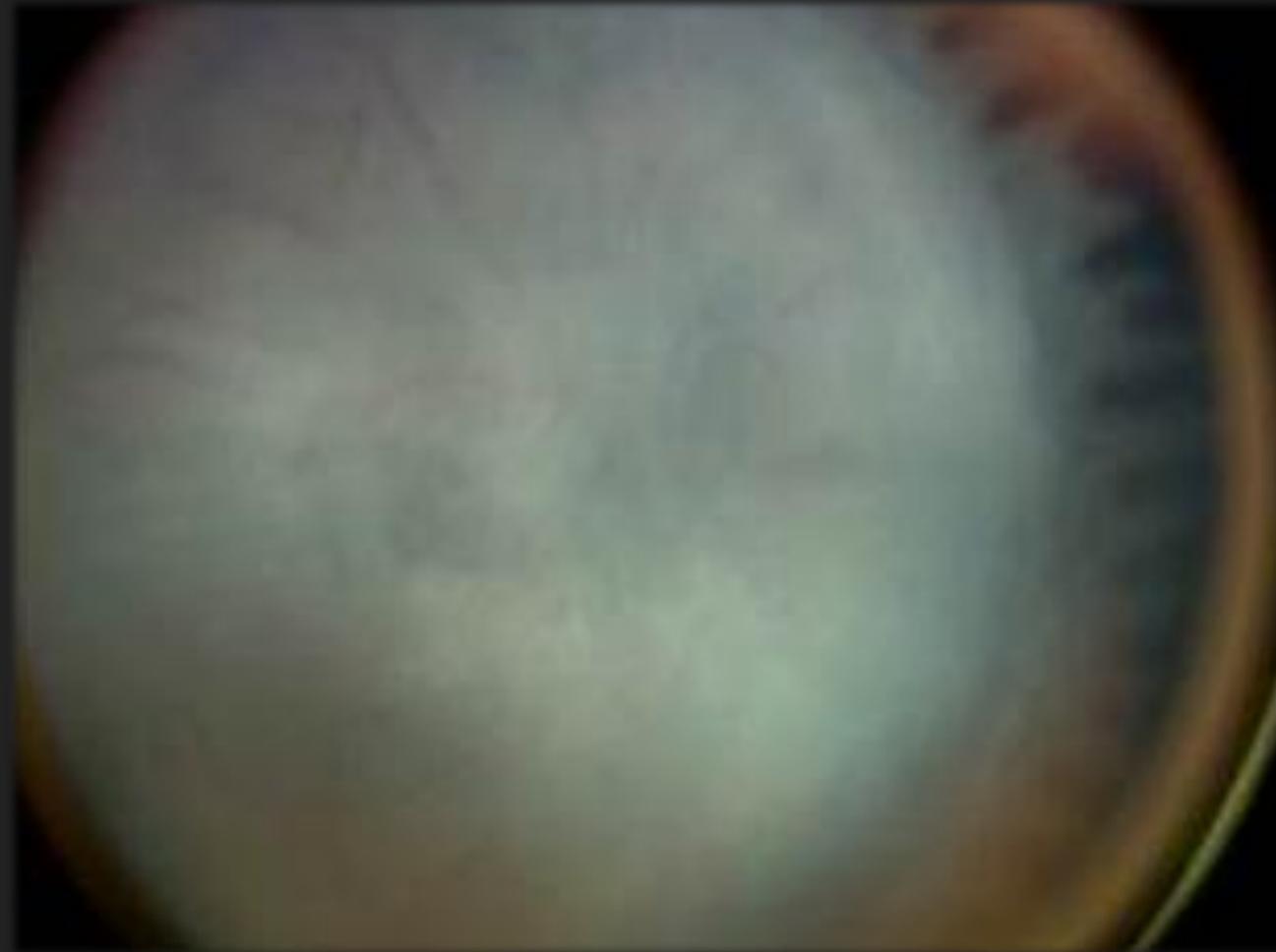
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Stage 5A: Open Funnel RD  
with visible optic disc

# ICROP 3 UPDATES

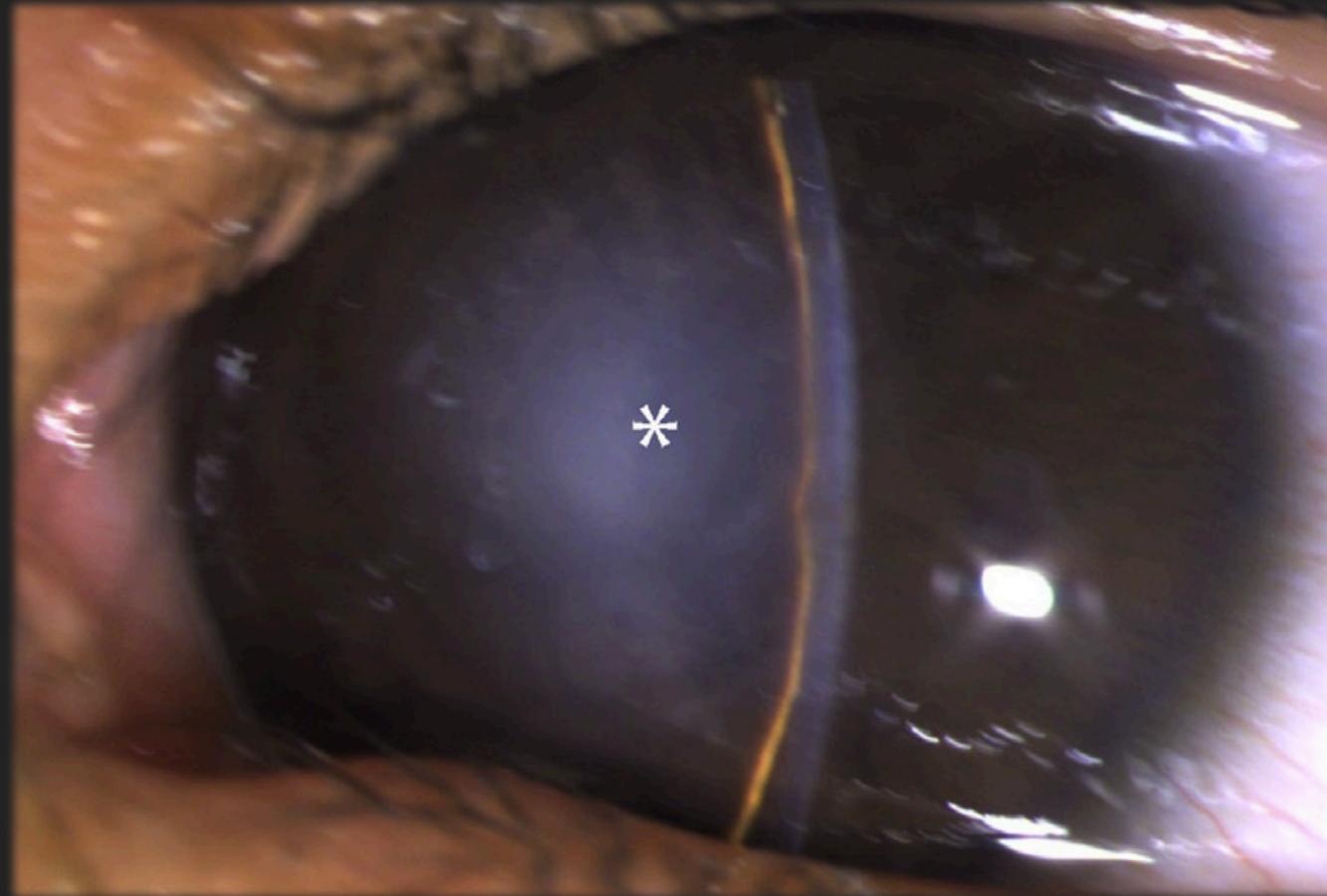
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Stage 5B: Closed Funnel RD or  
Retrolental fibrosis with no visible optic  
disc yet normal ant segment

# ICROP 3 UPDATES

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Stage 5C: Total RD with anterior segment abnormalities

# ICROP 3 UPDATES

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## AGGRESSIVE POSTERIOR ROP (AP-ROP)- AGGRESSIVE ROP (A-ROP)

**AP-ROP** was added to the ICROP II in 2005 to describe a severe, rapidly progressive form of ROP located in zone I or posterior zone II. Previously known as rush disease

**AP-ROP** as originally described typically affected the very pre-mature infants.

## A-ROP VS AP-ROP



### International Classification of Retinopathy of Prematurity, Third Edition

Michael F. Chiang, MD,<sup>1</sup> Graham E. Quinn, MD, MSCE,<sup>2</sup> Alistair R. Fielder, FRCP,<sup>3</sup> Susan R. Ostmo, MS,<sup>4</sup> R.V. Paul Chan, MD,<sup>5</sup> Audina Berrocal, MD,<sup>6</sup> Gil Binenbaum, MD, MSCE,<sup>2</sup> Michael Blair, MD,<sup>7,8</sup> J. Peter Campbell, MD, MPH,<sup>9</sup> Antonio Capone, Jr., MD,<sup>9</sup> Yi Chen, MD,<sup>10</sup> Shugan Dai, MD,<sup>11</sup> Anna Ellis, MD,<sup>12</sup>

### AP-ROP

that a continuous spectrum of vascular abnormality exists from normal to plus disease). Updates also include the definition of aggressive ROP to replace aggressive-posterior ROP because of increasing recognition that aggressive disease may occur in larger preterm infants and beyond the posterior retina, particularly in regions of the world with limited resources. ROP regression and reactivation are described in detail, with additional description of long-term sequelae.

### New vessels in zone 2

vision and imaging. Each of which used relative teleconferencing and an online message board to identify key challenges and approaches. Subsequently, the entire committee used iterative videoconferences, 2 in-person multiday meetings, and an online message board to develop consensus on classification.

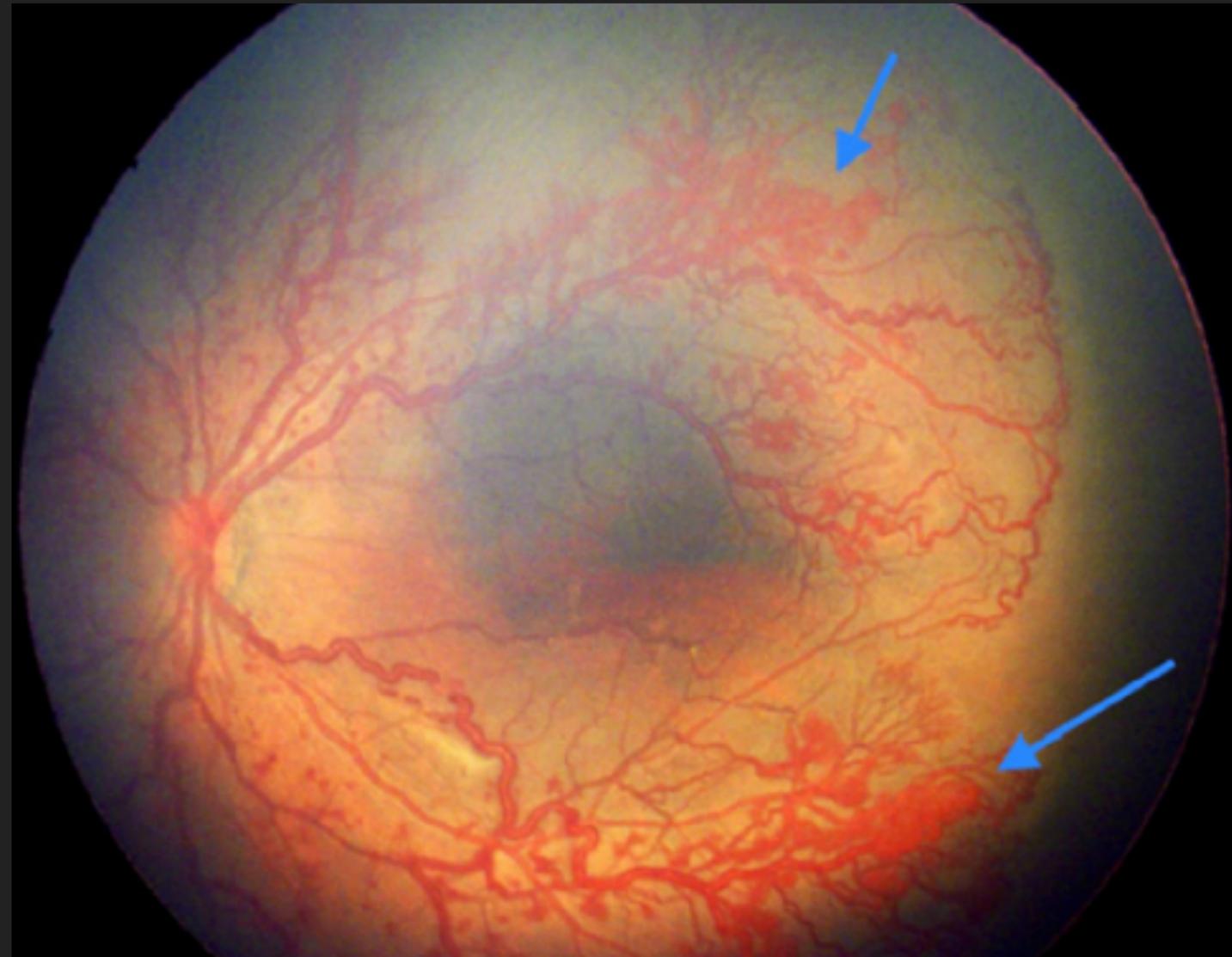
**Main Outcome Measures:** Consensus statement.  
**Results:** The ICROP3 retains current definitions such as zone (location of disease), stage (appearance of disease at the avascular-vascular junction), and circumferential extent of disease. Major updates in the ICROP3 include refined classification metrics (e.g., *posterior zone II*, *notch*, subcategorization of stage 5, and recognition that a continuous spectrum of vascular abnormality exists from normal to plus disease). Updates also include the definition of aggressive ROP to replace aggressive-posterior ROP because of increasing recognition that aggressive disease may occur in larger preterm infants and beyond the posterior retina, particularly in regions of the world with limited resources. ROP regression and reactivation are described in detail, with additional description of long-term sequelae.

**Conclusions:** These principles may improve the quality and standardization of ROP care worldwide and may provide a foundation to improve research and clinical care. *Ophthalmology* 2021;128:e51-e68 Published by Elsevier on behalf of the American Academy of Ophthalmology

# ICROP 3 UPDATES

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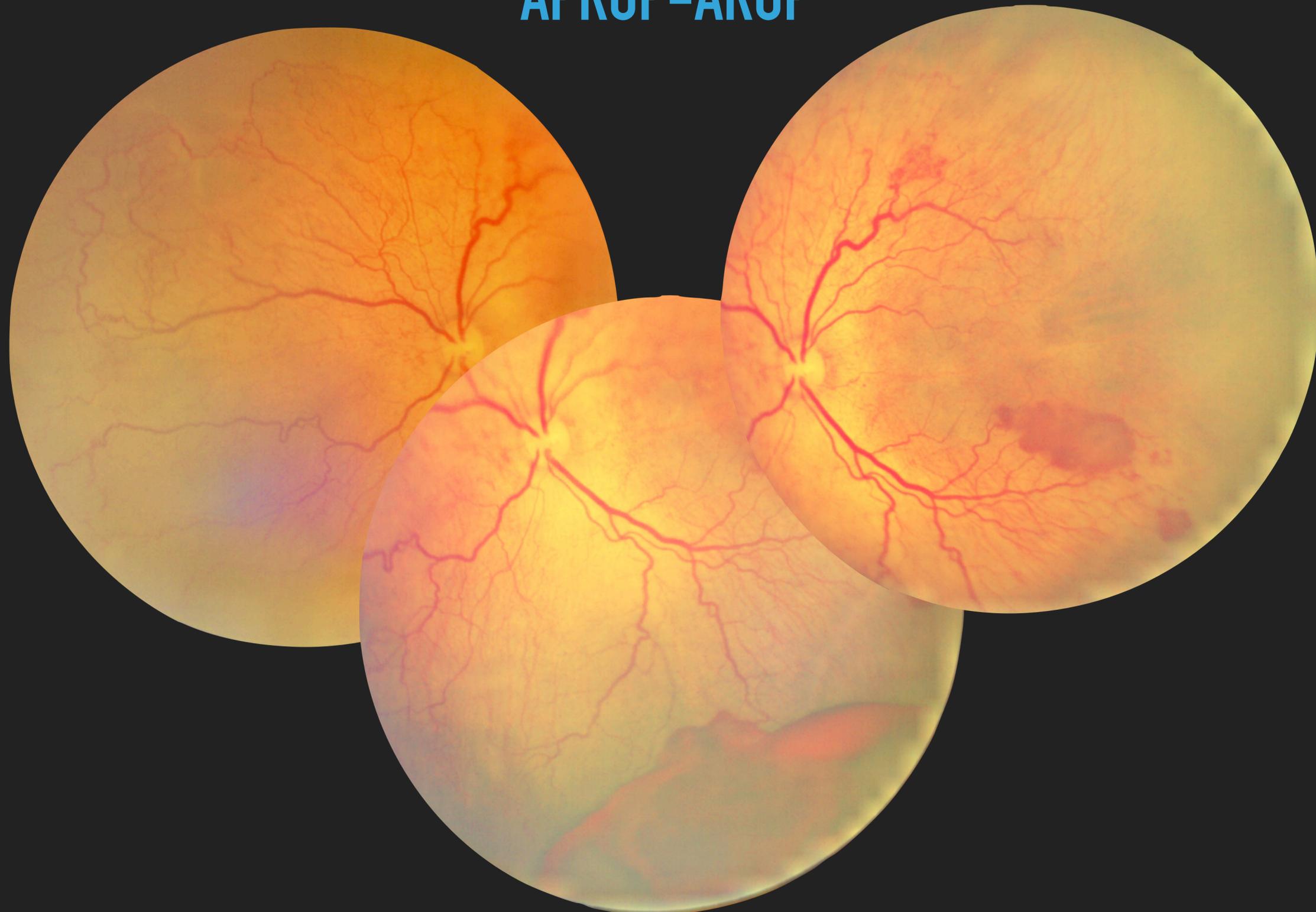
## APROP-AROP



# ICROP 3 UPDATES

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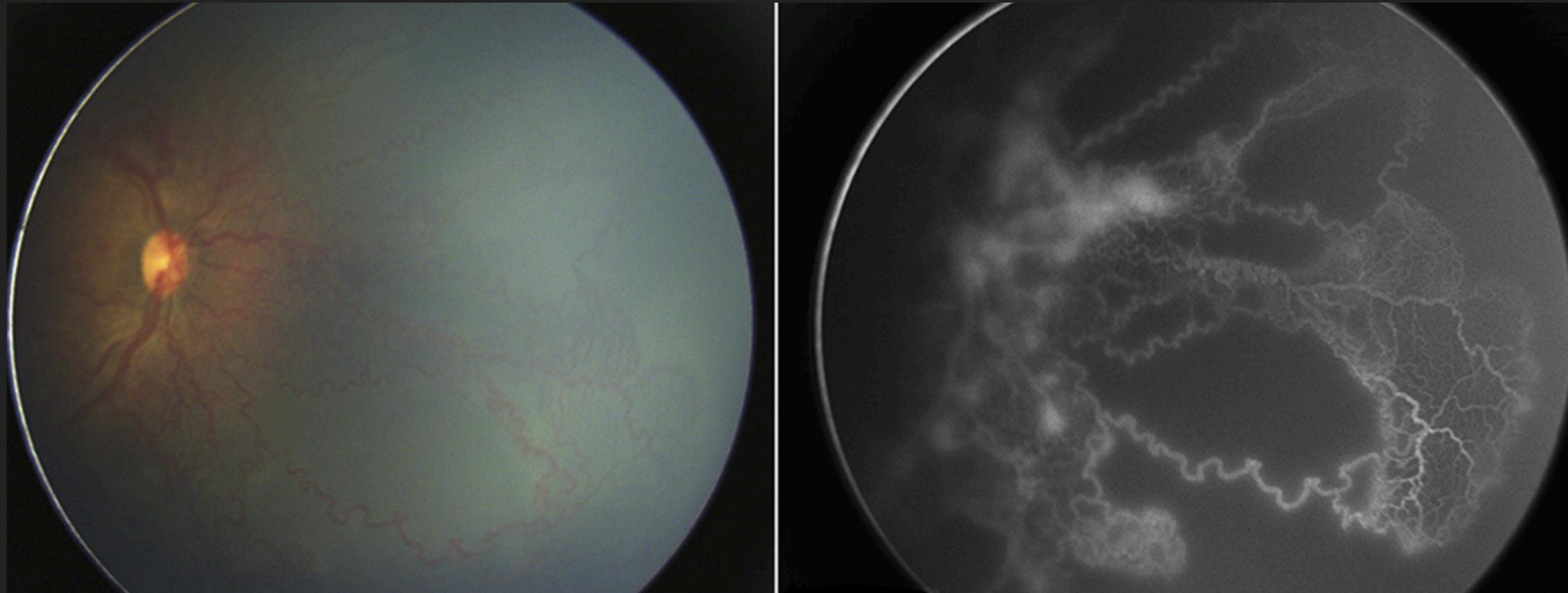
## APROP-AROP



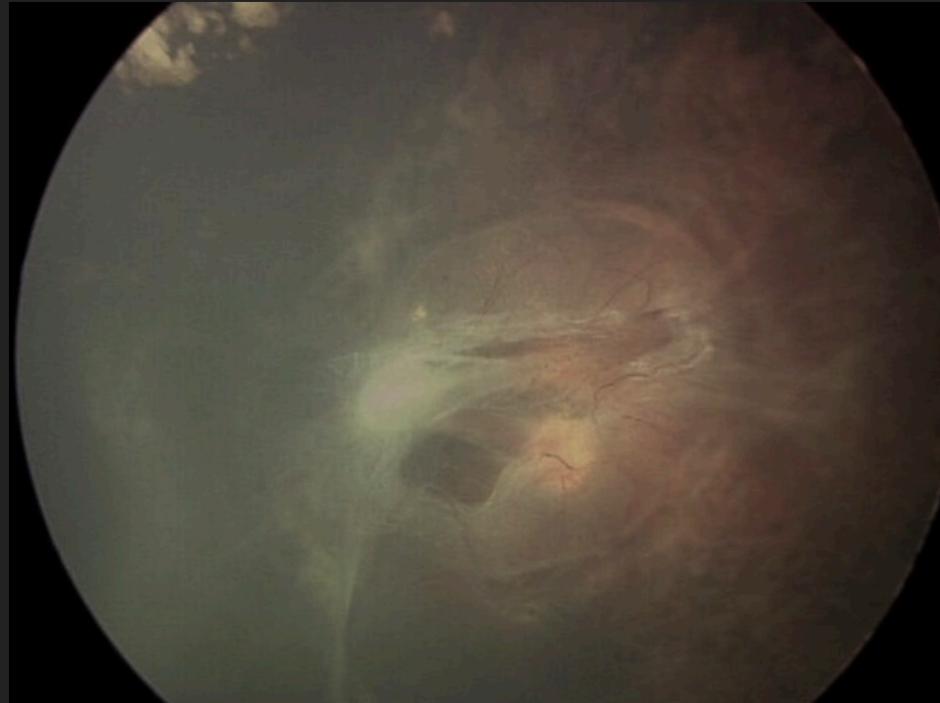
# ICROP 3 UPDATES

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## APROP-AROP



Eyes with **A-ROP** can demonstrate a unique posterior detachment pattern called **Volcano tractional detachment** generally involving the fovea, in which the peripheral retina remains attached.



**NEW  
NOMECLATURE**

**REGRESSION,  
REACTIVATION, &  
LONG-TERM SEQUELAE**

# REGRESSION, REACTIVATION, & LONG-TERM SEQUELAE

- Regression: which refers to disease involution and resolution
- Reactivation: which refers to recurrence of acute phase features.
- Regression may be complete or incomplete including persistence of retinal abnormalities.
- Regression & reactivation should not be regarded as either the reverse or the repetition of acute ROP.

# REGRESSION

- Spontaneous or treatment-induced
- Regression tend to occur more rapidly after anti-VEGF therapy (1-3 d) than after laser photocoagulation (7-14 d)

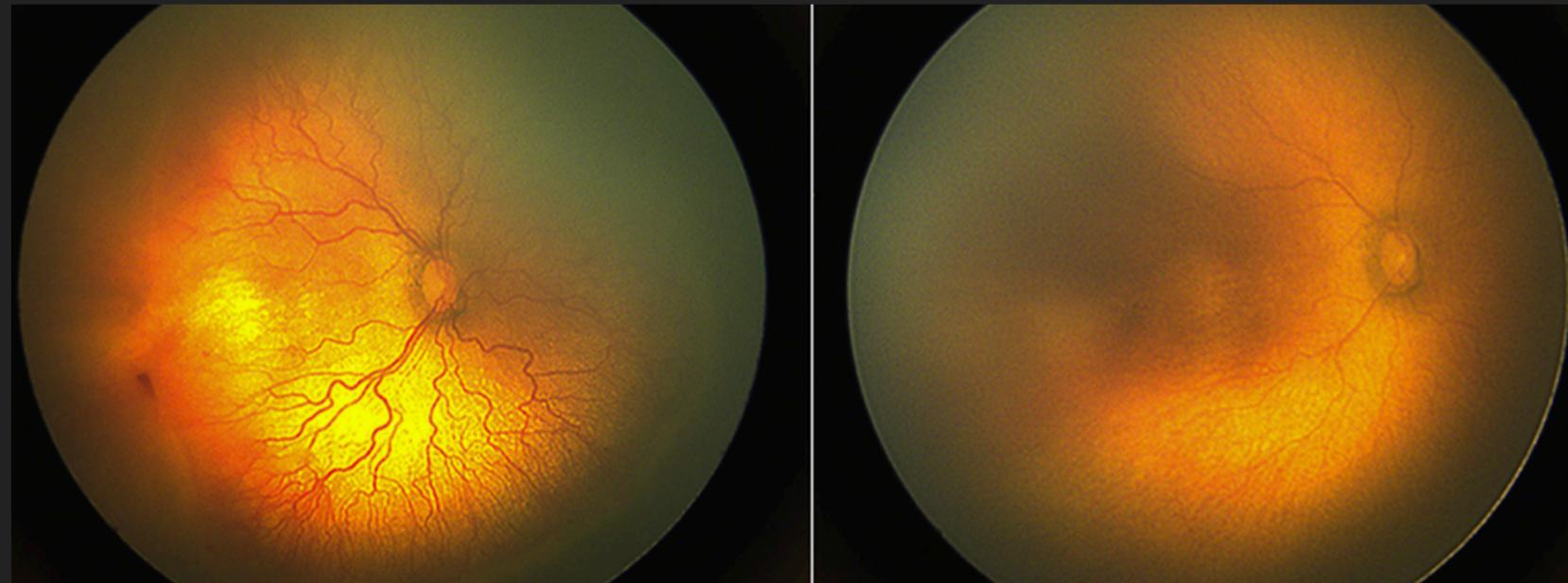
# SIGNS OF REGRESSION

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- Decreased plus disease
- Involution of tunica vasculosa lentis
- Better pupillary dilation
- Greater media clarity
- Resolution of intraretinal hemorrhages.



**REGRESSION AFTER LASER**



**REGRESSION AFTER ANTI-VGEF**

# REGRESSION

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## PERIPHERAL AVASCULAR RETINA

- Vascularization into the peripheral avascular retina can be **complete or incomplete**, the latter being termed **persistent avascular retina (PAR)**
- **PAR** after ttt with anti-VEGF agents seems to occur with greater frequency and involve a larger retinal area.

# REACTIVATION

- Reactivation is seen **more frequently after anti-VEGF treatment** than after spontaneous regression and rarely if ever occurs after complete laser photocoagulation.
- Literature stated that it most commonly occurs between **37 and 60 weeks' PMA.** & may occur significantly later, especially if reinjections are performed.

# REACTIVATION SIGNS

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- Wide spectrum (new self-limiting demarcation line to reactivated stage 3 with plus disease)
- Vascular changes in ROP reactivation include recurrent vascular dilation, tortuosity, or both or appearance of Nvs

# REACTIVATION

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- Documentation of reactivation should specify presence and location of new ROP features, noted by zone and stage using the modifier reactivated.

(Example : presence of a demarcation line during reactivation would be noted as "reactivated stage 1.")

- If multiple ridges are present, the modifier reactivated is applied to the **more anterior ridge**, which is typically **more active**.

# CONCLUSION

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- The ICROP III retains current definitions such as zones , stage and circumferential extent of disease.

## Major updates in the ICROP3 include

- Def. of posterior zone II, notch, subcategorization of stage 5, and recognition that a continuous spectrum of vascular abnormality exists from normal to plus disease
- **Also include the definition of aggressive ROP to replace aggressive-posterior ROP** because of increasing recognition that aggressive disease may occur in larger preterm infants and beyond the posterior retina, particularly in regions of the world with limited resources
- ROP regression and reactivation are described in detail, with additional description of long-term sequelae.



**THANK YOU**

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**TILL NEXT MEETING**



**THANK YOU**

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**TILL NEXT MEETING**

RESEARCH

Open Access



## Analysis of a two-year independent screening effort for retinopathy of prematurity in rural Egypt

Sara Tawfik<sup>1,2</sup>, Ahmed Mansour<sup>2,3</sup>, Norhan Lotfy Selim<sup>1,2</sup>, Ahmed M. Habib<sup>2,3</sup>, Yousef A. Fouad<sup>2,3\*</sup>, Mohamed A. Tawfik<sup>1,2,4</sup> and Mariam Al-Feky<sup>2,3,5</sup>

outcome was favorable in 83 eyes (98.8%). Applying the American Academy criteria would have led to the missing of 36.8% of infants with ROP and 28.6% of those requiring treatment in our sample.

# ICROP IN NUTSHELL

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## 1. Zone.

- a. Definition of 3 retinal zones centered on the optic disc. The location of the most posterior retinal vascularization or ROP lesion denotes the zone for the eye.
- b. Definition of a posterior zone II region that begins at the margin between zone I and zone II and extends into zone II for 2 disc diameters.\*
- c. The term *notch* is used to describe an incursion by the ROP lesion of 1–2 clock hours into a more posterior zone. The ROP zone for such eyes should be noted by the most posterior zone of retinal vascularization with the qualifier “notch” (e.g., “zone I secondary to notch”).\*

2. Plus and Preplus Disease. Plus disease is defined by the appearance of dilation and tortuosity of retinal vessels, and preplus disease is defined by abnormal vascular dilation, tortuosity insufficient for plus disease, or both. Recognition that retinal vascular changes in ROP represent a continuous spectrum from normal to preplus to plus disease, with sample images demonstrating this range.\* These changes should be assessed by vessels within zone I, rather than from only vessels within the field of narrow-angle photographs and rather than from the number of quadrants of abnormality.\*

3. Stage of Acute Disease (Stages 1–3). Stage of acute disease is defined by the appearance of a structure at the vascular–avascular juncture as stage 1 (demarcation line), stage 2 (ridge), and stage 3 (extraretinal neovascular proliferation or flat neovascularization). If more than 1 ROP stage is present, the eye is classified by the most severe stage.

4. Aggressive ROP. The term aggressive-posterior ROP was used previously to describe a severe, rapidly progressive form of ROP located in posterior zones I or II. Because of increasing recognition that this may occur beyond the posterior retina and in larger preterm infants, particularly in regions of the world with limited resources, the Committee recommends the new term aggressive ROP.\*

# ICROP IN NUTSHELL

## 5. Retinal Detachment (Stages 4 and 5).

- a. Stages of retinal detachment are defined as stage 4 (partial: 4A with fovea attached, 4B with fovea detached) and stage 5 (total).
- b. Definition of stage 5 subcategories: stage 5A, in which the optic disc is visible by ophthalmoscopy (suggesting open-funnel detachment); stage 5B, in which the optic disc is not visible because of retrolental fibrovascular tissue or closed-funnel detachment; and stage 5C, in which stage 5B is accompanied by anterior segment changes (e.g., marked anterior chamber shallowing, iridocorneolenticular adhesions, corneal opacification), suggesting closed-funnel configuration.\* Additional descriptors of funnel configuration (e.g., open-closed) may be applied if clinically useful.

## 6. Extent of Disease. Defined as 12 sectors in using clock-hour designations.

## 7. Regression. Definition of ROP regression and its sequelae, whether spontaneous or after laser or anti-vascular endothelial growth factor treatment. Regression can be complete or incomplete. Location and extent of peripheral avascular retina (PAR) should be documented.\*

## 8. Reactivation. Definition and description of nomenclature representing ROP reactivation after treatment, which may include new ROP lesions and vascular changes. When reactivation of ROP stages occurs, the modifier reactivated (e.g., “reactivated stage 2”) is recommended.\*

## 9. Long-Term Sequelae. Emphasized beyond previous versions of the ICROP, including sequelae such as late retinal detachments, PAR, macular anomalies, retinal vascular changes, and glaucoma.

# ICROP HX

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- 1984 ICROP I was developed by 23 ophthalmologists from 11 countries.
- 1987 ICROP I was expanded to include RD
- 2005 ICROP II was revisited to incorporate advances during the intervening years including definition of preplus disease & AP-ROP

# LONG TERM SEQUALEA

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Patients with a Hx of premature birth, even without history of ROP, exhibit a spectrum of ocular abnormalities that may lead to permanent sequelae.

- Late TRD, RRD, or, rarely ERD
- Retinoschisis from chronic traction of involuted stage 3
- Persistent avascular retina. (PAR)
- PAR is prone to retinal thinning, holes, and lattice- like changes & may be associated with RD later in life.
- Macular anomalies including smaller foveal avascular zone and blunting or absence of the foveal depression
- Retinal vascular changes. persistent tortuosity, straightening of the vascular arcades with macular dragging, and falciform retinal fold.
- Circumferential interconnecting vascular arcades, and telangiectatic vessels occur frequently.

# REGRESSION, REACTIVATION, AND LONG-TERM SEQUELAE

- To date, ROP classification has focused on acute disease, with less attention to regression
- The introduction of anti-VEGF agents has presented new challenges.
- The clinical features and time course of regression after anti-VEGF treatment of ROP differ compared with those of laser-treated

**ICROP I : 1984  
1987 (UPDATED & EXTENDED)**

**ICROP II 2005**

**ICROP III 2021**