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Retinopathy of Prematurity Paediatrician's Role

Outline : Retinopathy of prematurity

- Introduction & clinical course
- Classification
- Screening and follow up
- Treatment
- Key messages

Introduction

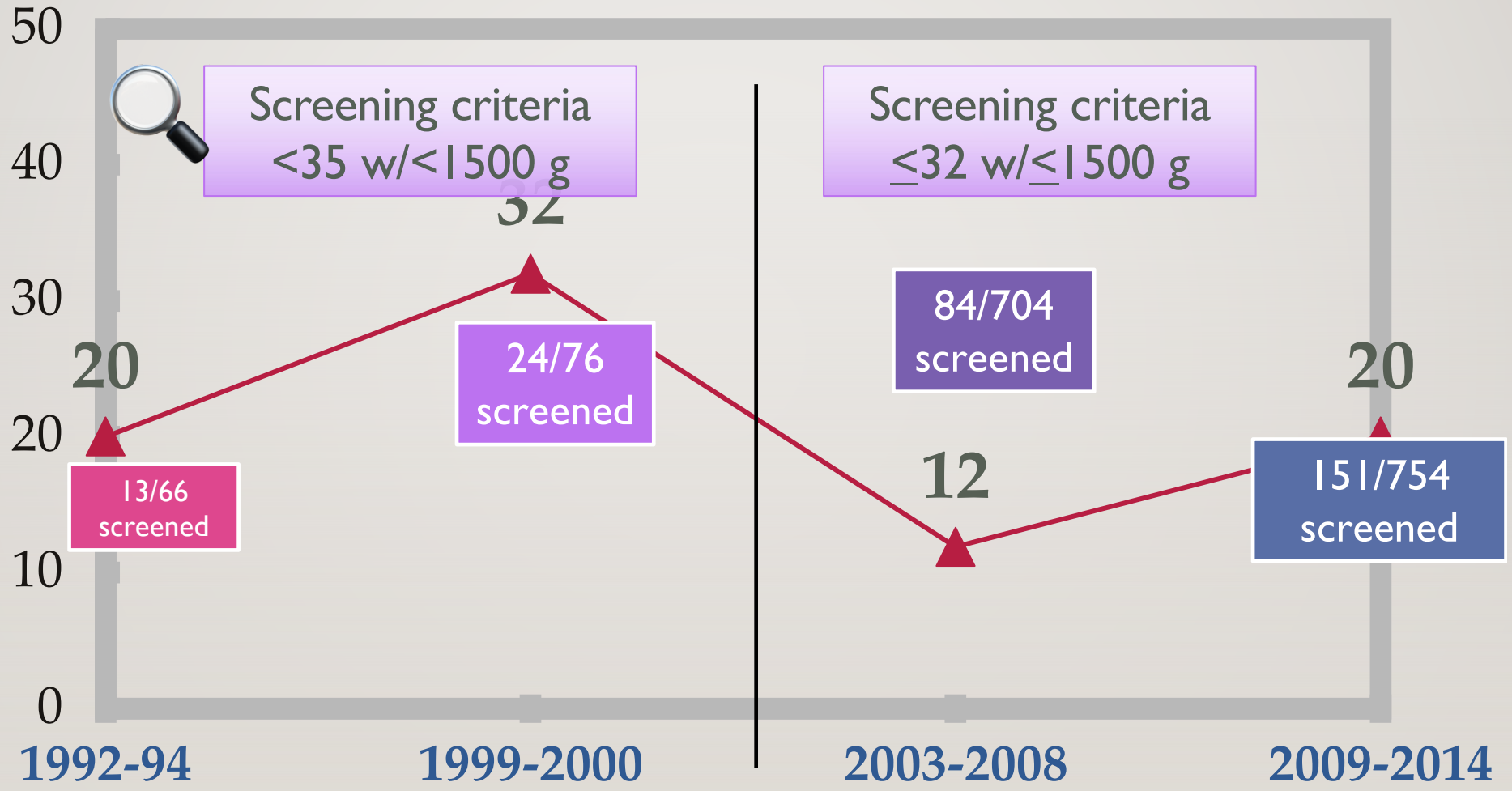
"One of the leading causes of severe visual impairment in childhood"

Category	Prevalence (%)
Any ROP	38 to 47 (36% at AIIMS*)
ELBW	16 to 48
VLBW	27 to 35
LBW (> 1500 g)	32

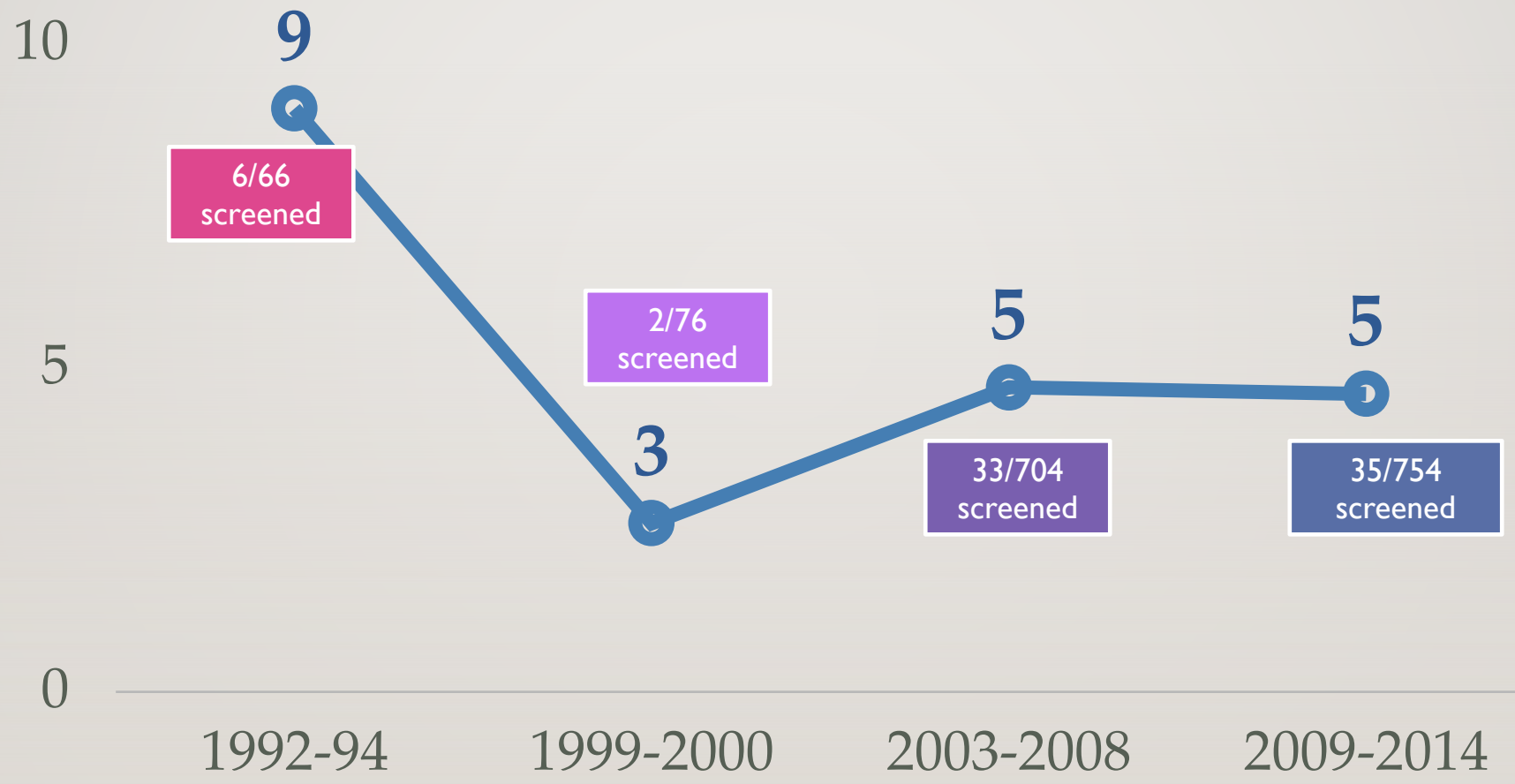
Screening examination of premature infants for retinopathy of prematurity. Pediatrics. 2013; 131: 189-95

*Thomas et al, Diagnostic Accuracy of WINROP, CHOP-ROP and ROPScore in Detecting Type 1 Retinopathy of Prematurity. Indian Pediatrics 2021

Disease burden: Any ROP



Disease burden: Threshold or severe ROP

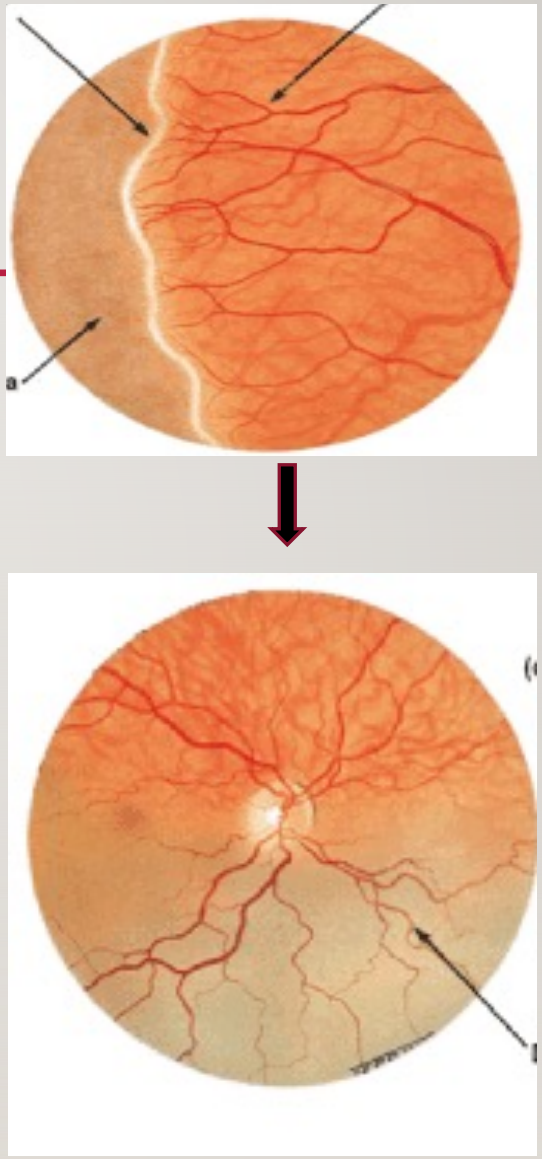


Risk factors

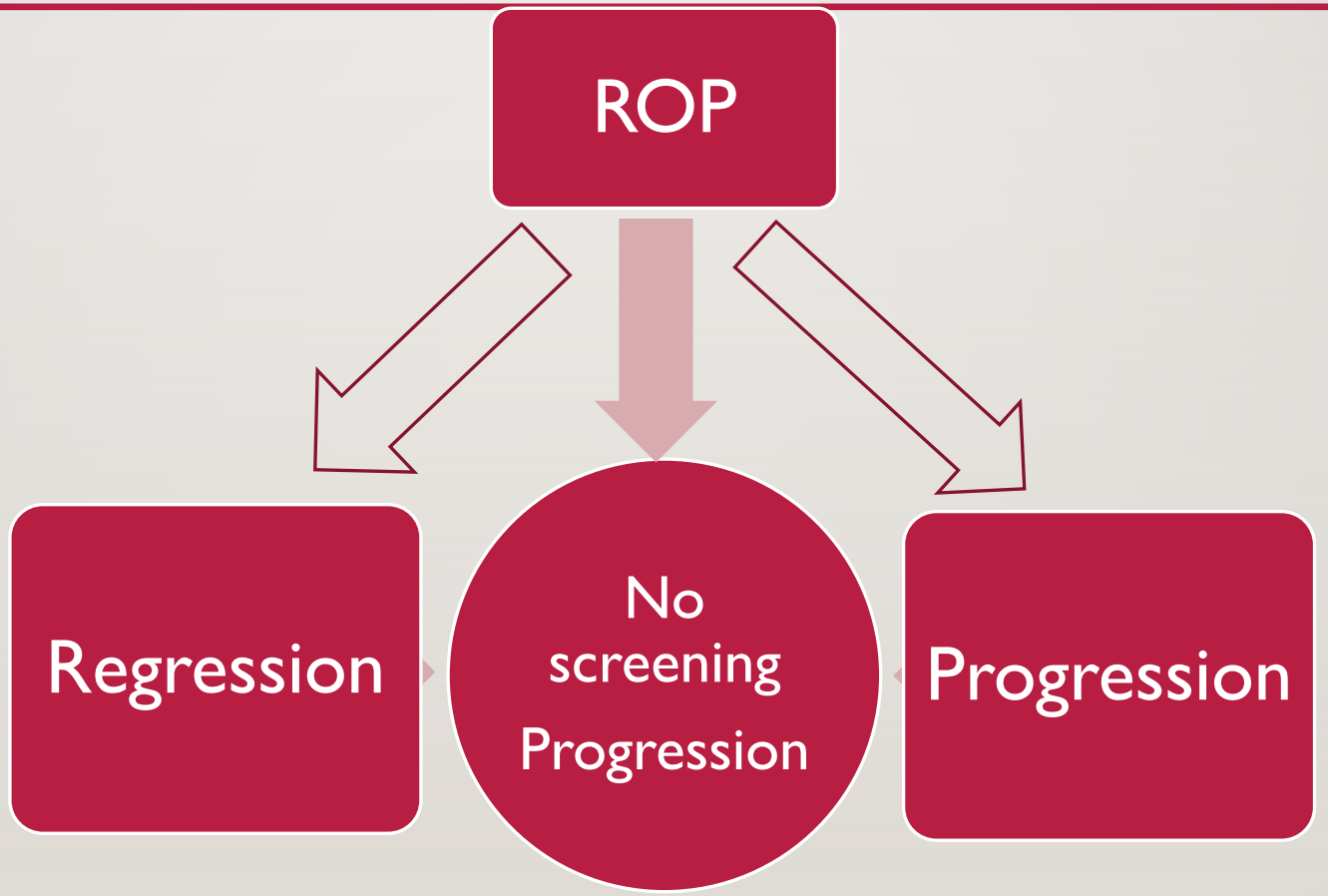
- Prematurity and Low birth weight (LBW)
- Injudicious use of oxygen
- Need for blood transfusions
- Sepsis
- Mechanical ventilation
- Use of CPAP
- Requirement of inotropes
- Any sick LBW baby
- Poor weight gain

Clinical course

- Development of new abnormal blood vessels in the eyes of preterm babies
- ROP begins at **31- 32 weeks** postmenstrual age (PMA) and progresses over the next 2 to 5 weeks
- However, ROP usually does not manifest before **2-3 weeks** of post natal age



Clinical course



Outline : Retinopathy of prematurity

- Introduction & clinical course
- **Classification**
- Screening and follow up
- Treatment
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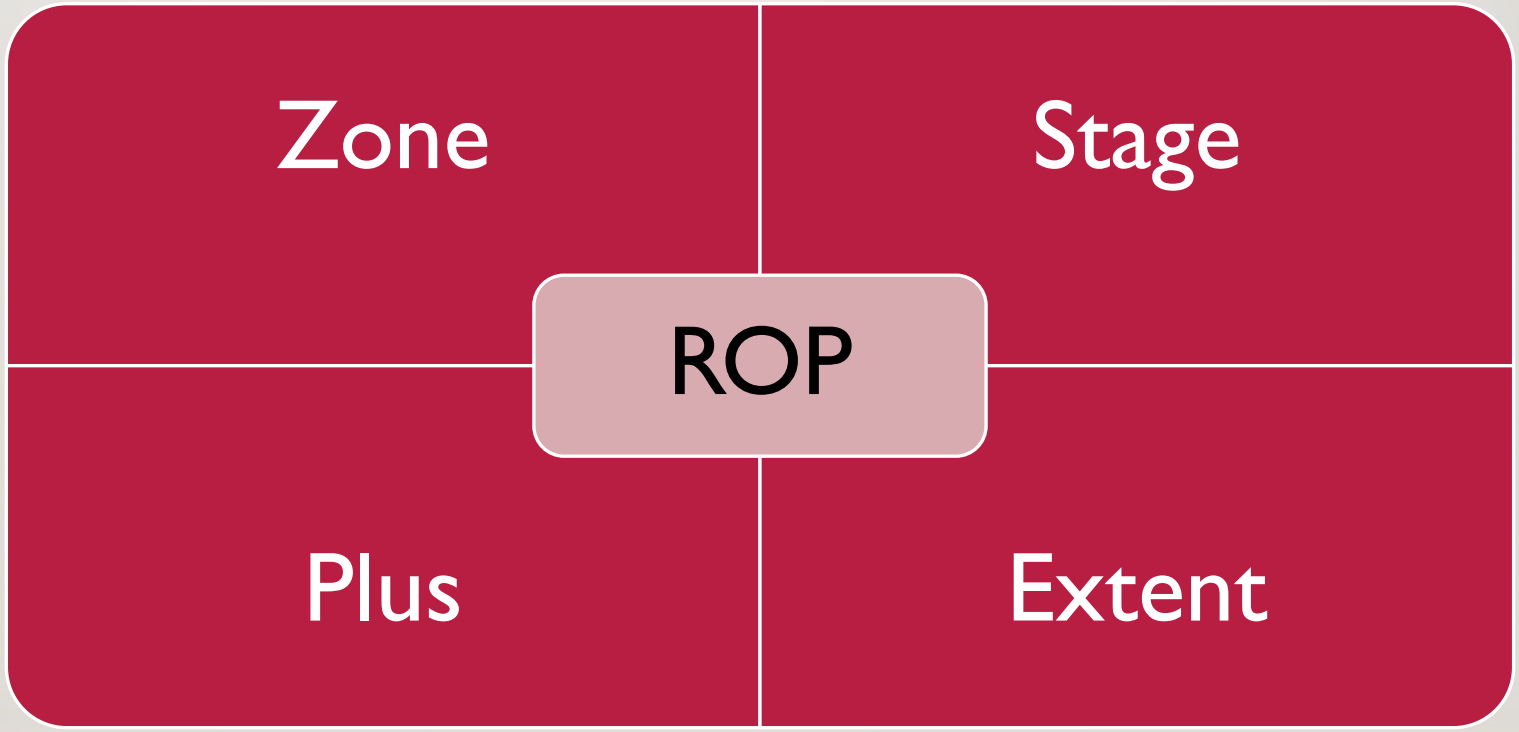
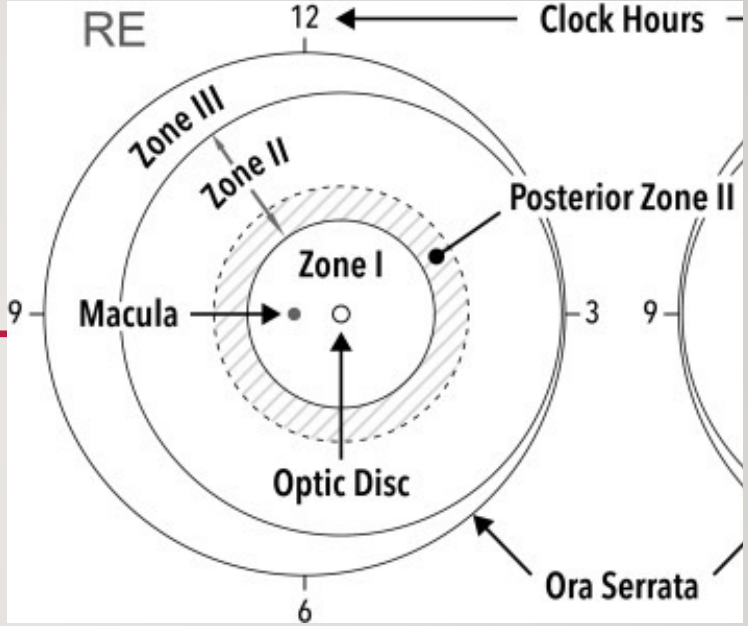
Classification of ROP

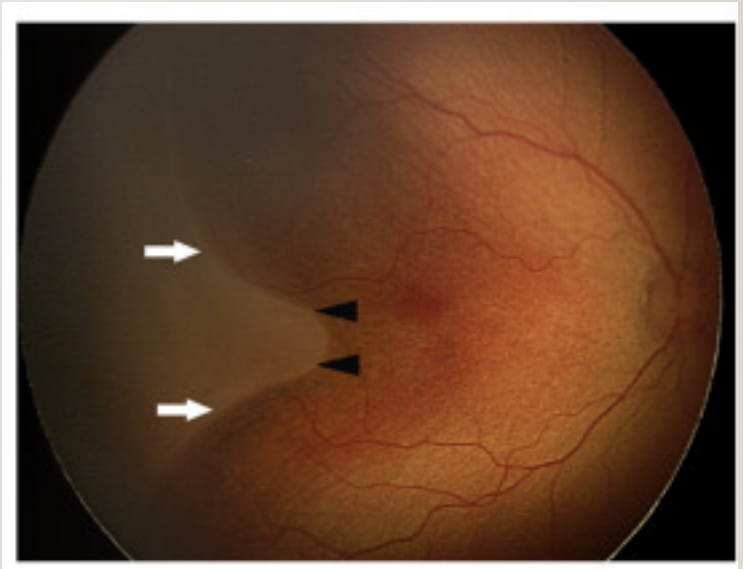


International Classification of Retinopathy of Prematurity, Third Edition 2021

Location

- ***Zone 1:*** A circle whose radius is twice the distance from the centre of the optic disc to the centre of macula
- ***Zone 2:*** A circle whose radius is the distance from the centre of the optic disc to the nasal margin of the retina
- **'Posterior' zone II: 2 disc diameters peripheral to Zone I***
- ***Zone 3:*** The remainder of the retina, from Zone II to ora-serrata on nasal side and equator on temporal side
- ***'Notch': I*ncursion by the ROP lesion of 1–2 clock hours into a more posterior zone***

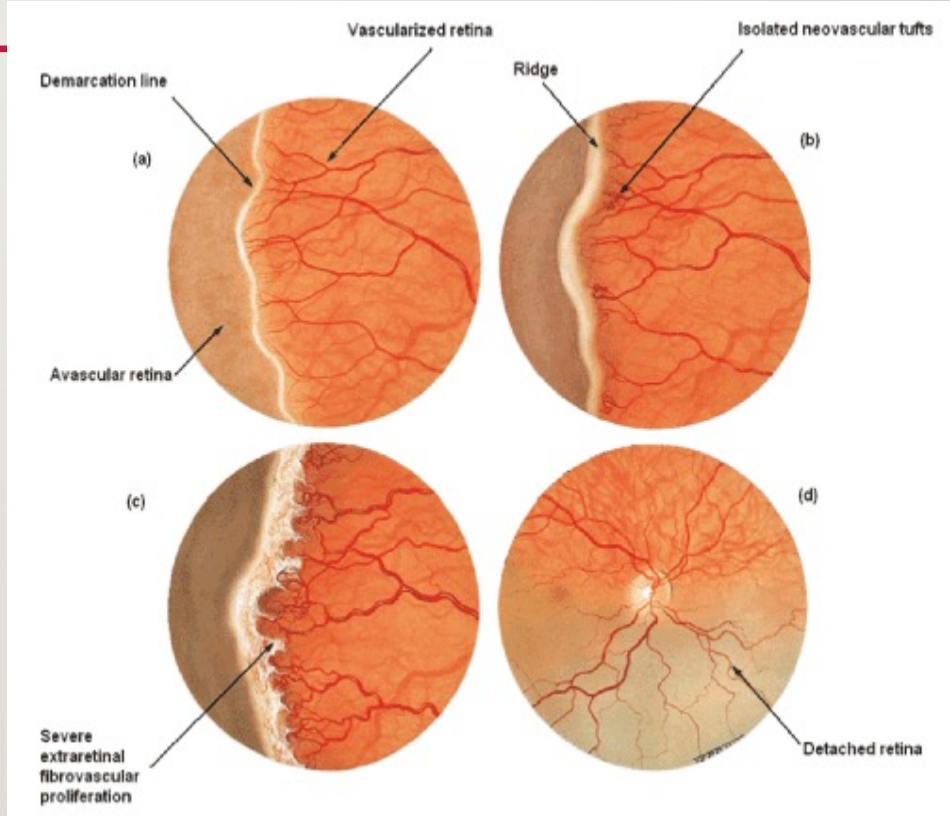




*Updated in ICROP-3

Stage/severity

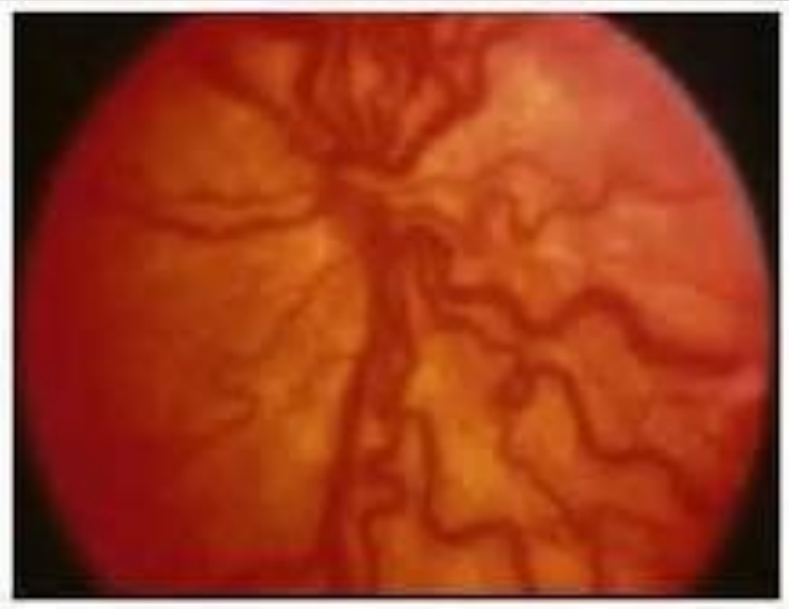
Stage	Description
1.	Demarcation ***line***
2.	Demarcation ***ridge*** (definite height and width)
3.	Presence of ***extra-retinal fibrovascular proliferation***
4.	***Partial retinal detachment*** ○ 4A: Fovea attached ○ 4B: Fovea detached
5.	***Complete retinal detachment**** ○ 5A: Optic disc is visible by ophthalmoscopy (*open-funnel detachment)* ○ 5B: Optic disc is not visible because of retrolental fibrovascular tissue *(closed-funnel detachment)* ○ 5C: 5B, with anterior segment changes *(closed-funnel configuration)*



**** Updates in ICROP-3***

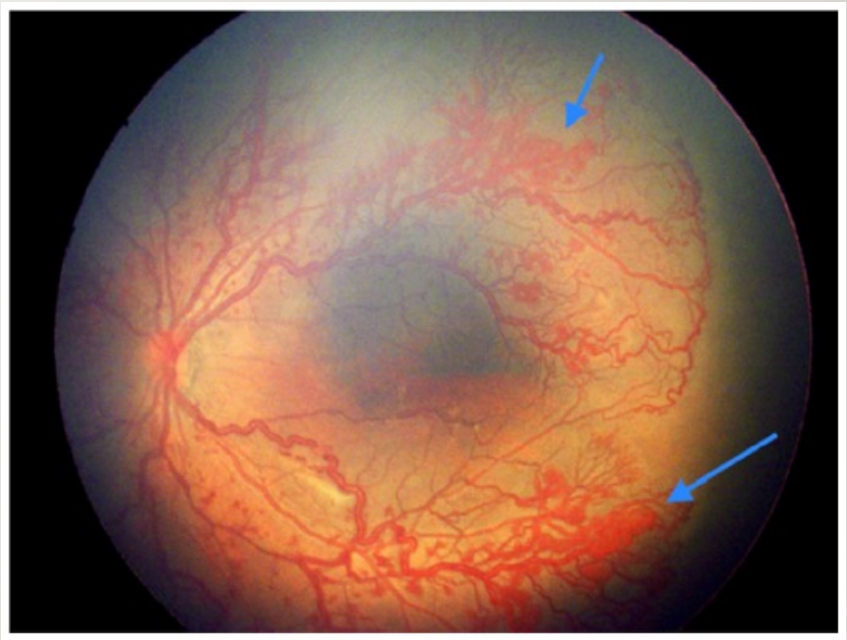
Plus disease

- Increased venous dilation
- Arteriolar tortuosity of the posterior retinal vessels
- If there is **poor pupillary dilatation** (rigid pupil), you should suspect plus disease



Aggressive ROP (A-ROP)

- Rapidly progressing, severe form of ROP in the smallest and most immature infants
- Ill-defined retinopathy with no sequence of changes
- Prominence of plus disease
- **Key features**: 'Tempo' and 'vascular abnormalities'
- High risk of very early retinal detachment



Consequences of ROP

- Reactivation
- Persistent avascular retina
- Refractive errors
- Squint
- Unilateral or bilateral Blindness
- Late retinal detachment (6 months-31 years)
- Secondary angle closure glaucoma

Outline : Retinopathy of prematurity

- Introduction & clinical course
- Classification
- **Screening and follow up**
- Treatment
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Whom to screen?

Infants with either of the following:

1. Birth weight less than 2000 grams OR
2. Gestation age less than 34 weeks OR
3. Any preterm infant (34-36 weeks) with risk factors*:
    i. Cardio-respiratory instability
    ii. Prolonged oxygen therapy (> 6 hours)
    iii. Blood transfusion
    iv. Sepsis
    v. Poor postnatal weight gain

***Admission to NICU /SCNU a surrogate marker (in absence of records)**

When to screen?

- First screening at **4 weeks** of postnatal age
- For infants, between **28 weeks** GA or birth weight **< 1200** grams:
  - 2-3 weeks after delivery *(Not later than 3 weeks)*

Comparison of screening guidelines

Organization	Gestation (weeks)	Birth weight (g)
RBSK	≤ 34	≤ 2000
NNF	< 34	< 1750
AIIMS	**<32**	**<1500**
AAP	<30	<1500

- The gestational age of infants is not always known or accurate;
- ROP has been reported in larger babies with a birth weight between 1500 and 2000g.

ROP screening: place, person and equipment

Who?	• Trained eye specialist
How?	• Indirect ophthalmoscope
Where ?	• SNCU/ NICU if the baby is still admitted • Defined area SNCU, if baby is discharged

Preparation of babies prior to screening

Keep NPO for 2hours

Tropicamide 0.5-1%:
1^{O} q 15mins 3-4 times

Phenylephrine 2.5% (available 10%): 1^{0} once

Topical anaesthetic drops:
Paracaine (0.5%)

Sucrose 25% if available: 2ml 2 minutes before the procedure

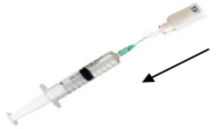
Post procedure antibiotics
eye drops

ROP Screening- Preparation and administration of eye drops

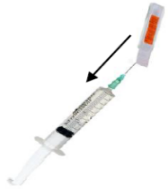
Eyedrops: Tropac P: 5ml vial- 5% phenylephrine and 0.8% tropicamide): - dilute to make 2.5 % phenylephrine and 0.4% tropicamide

Preparation

1) Withdraw 5 ml of Tropac P into a 10 ml syringe with a 26 G needle.

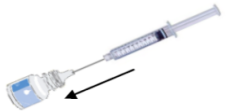


2) Withdraw 5ml of NS from a fresh respule.



3) Mix the contents well by shaking.

4) Push 5ml of the diluted drug back into the vial.



5) The vial should be used directly for instilling the drops.

6) Discard vial after the day's session.

Administration

1) Check patient list for ROP exam for the day - cross check with DOB.
2) Perform hand hygiene before and after handling each neonate.
3) Pull the lower palpebra and administer one drop of diluted Tropac P into the lower conjuctival sac.
4) Wipe away the excess drug from both eyes with sterile cotton with a single swipe medial to lateral.

5) Repeat a second dose after 20 minutes. Two doses are sufficient.

How to follow up after first ROP evaluation?

- **If no signs of ROP**:
  1. **Retina vascularized**: Visual follow up at 4 and 9 months of age
  2. **Retina avascular (Zone 2 and 3)**: Every 2-3 weeks till fully vascular
  3. **Retina avascular (Zone 1):** Every 1-2 weeks
- **If ROP is present:**

Zone of retinal finding	Stage	Follow up interval
Zone 1	Stage 1 or 2 ROP without plus disease	1 week
	Regressing ROP	1-2 weeks
Zone 2	Stage 1	2 weeks
	Stage 2	1-2 weeks
	Stage 3	1 week or less
	Regressing ROP	1-2 weeks
Zone 3	Stage 1 or 2	2-3 weeks
	Regressing ROP	2-3 weeks

Linking with RBSK

- Improve coordination and financial support
- Provision of equipment to screen and treat
- Long term follow up can be streamlined by involvement of frontline health workers
- Improvement of rehabilitation/referral services

Role of tele-medicine in screening

Benefits of wide-angle digital field imaging

For community:

- Efficient resource utilization with shortage of specialists
- Overcome geographic limitations
- Access to remote areas
- Cost-effective

For neonates:

- Less painful
- Education to parents
- Scope for discussion of detailed findings

MII RetCam

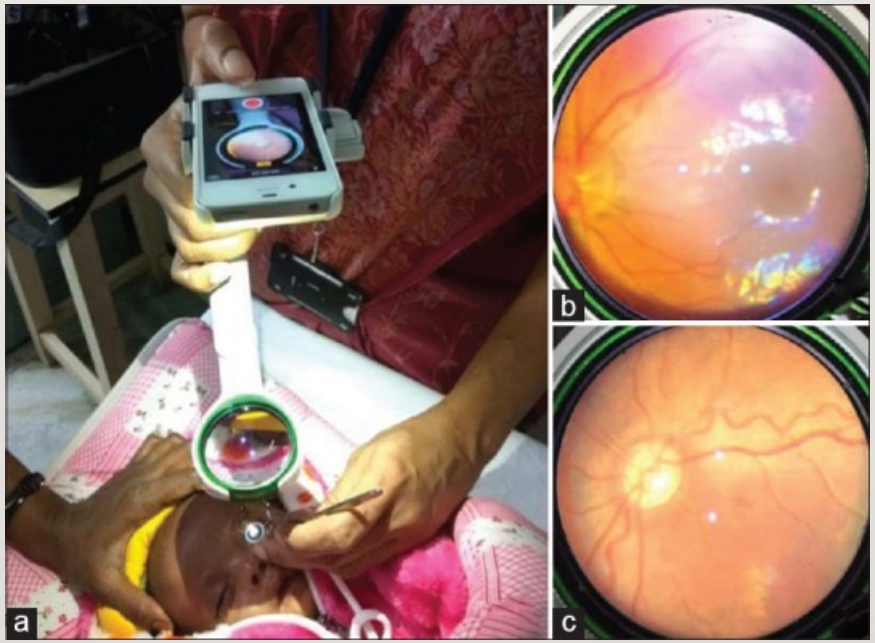
Role of tele-medicine in screening

SUNDROP, 2005

"With eight years of data from about 700 babies, we have identified—100 percent of the time—all retinopathy that requires treatment. We've lost no babies to blindness."

e-ROP, 2010

- 12 centres, US and Canada
- Good inter- and- intragrader agreement
- Detect serious ROP



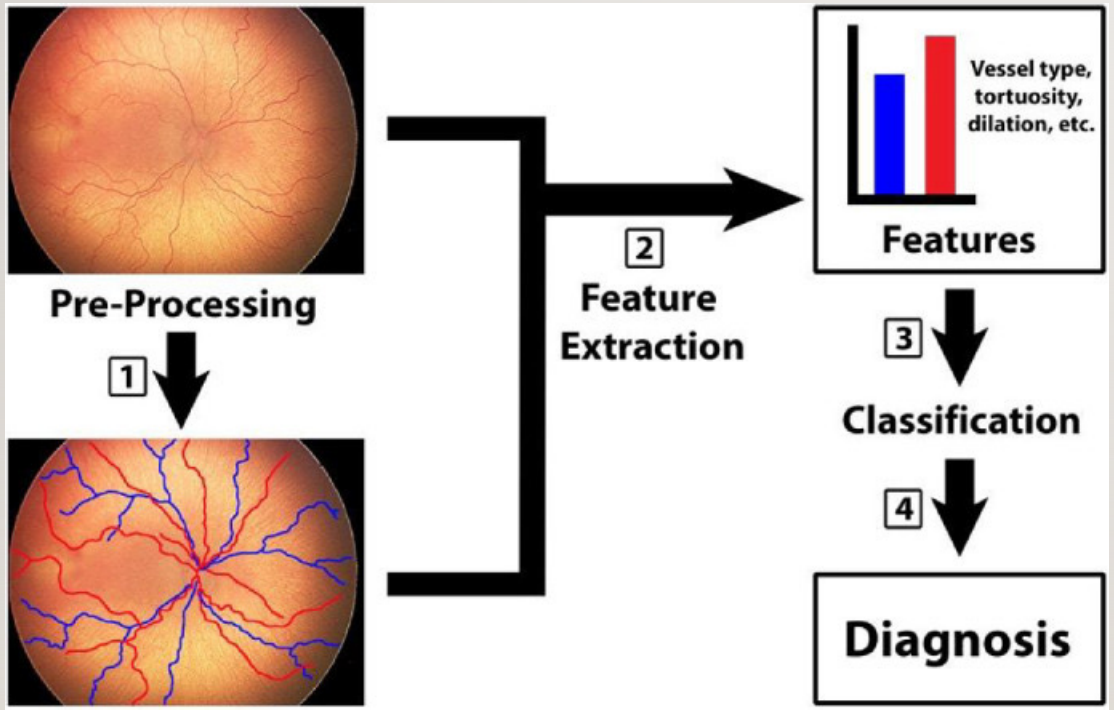
KIDROP, 2008

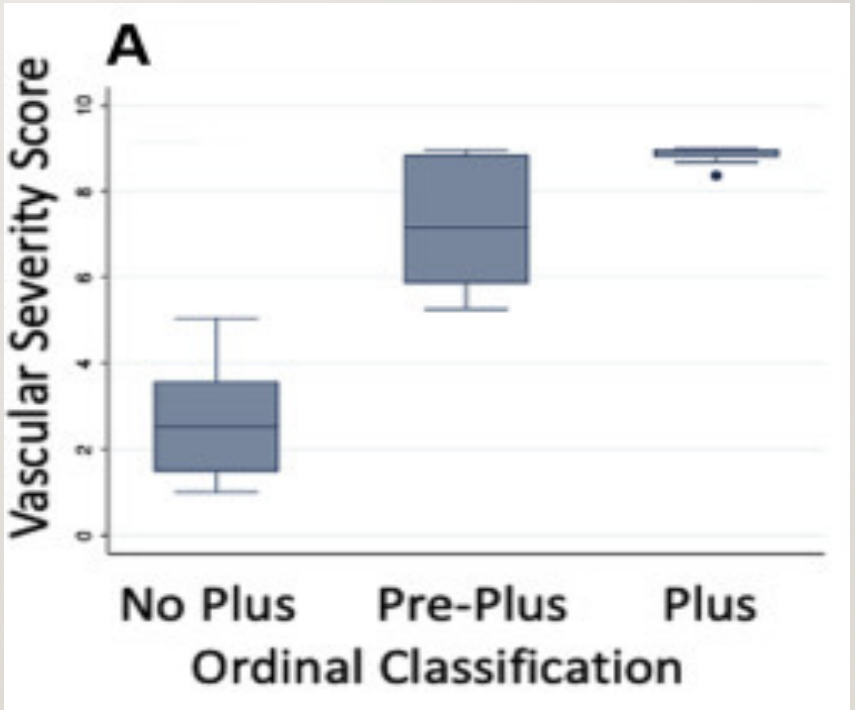
- Rural outreach centres
- Karnataka (24 million people)
- 20,000 retinal images
- Training of non-physicians for retinal scans

Image: Lekha et al, MII RetCam assisted smartphone based fundus imaging for retinopathy of prematurity. Indian Journal of Ophthalmology 2019

Role of artificial intelligence in screening

Scope: Lack of trained specialists and huge burden of preventable blindness
Good predictive and diagnostic ability





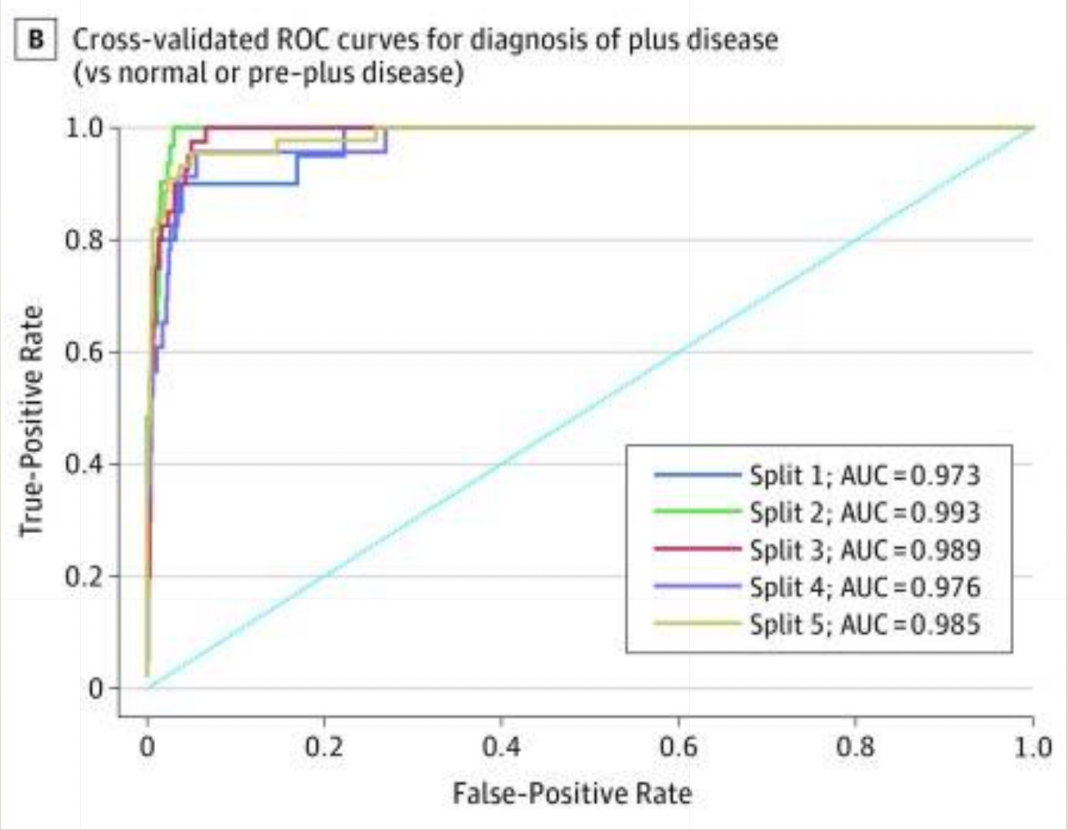
Campbell et al, Artificial Intelligence for Retinopathy of Prematurity: Validation of a Vascular Severity Scale against International Expert Diagnosis Ophthalmology 2022

Role of artificial intelligence in screening: iROP

- Deep learning with ***convolutional neural networks :*** i-ROP cohort (5500 images)
- Fully automated
- **93%** sensitivity and **94%** specificity
- Outperformed 6 of 8 ROP experts

Concerns for AI:

1. Generalisability
2. Negating the human factor
3. Dependence on fed data on output



Brown et al, Automated diagnosis of plus disease in retinopathy of prematurity using deep convolutional neural networks. JAMA Ophthalmol 2018

Outline : Retinopathy of prematurity

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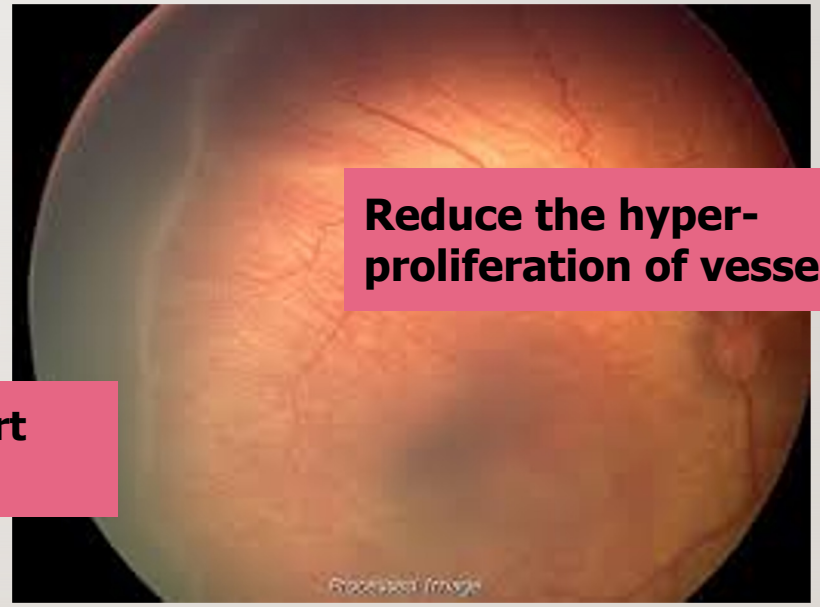
Treatment modalities

1. Laser photocoagulation
2. Cryotherapy
3. Anti -VEGF therapy
4. Retinal surgery

Laser photocoagulation

Indications (ETROP study)

- Zone I, any stage, with PLUS
- Stage 3, any zone, with PLUS
- Zone II Stage 2 with PLUS
- A-ROP

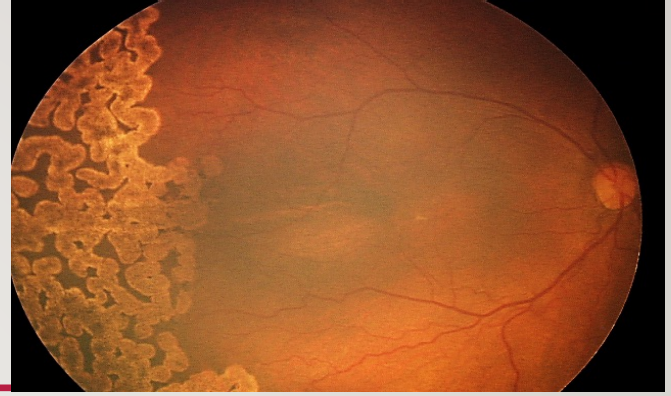


Type of laser: Double frequency Nd-YAG laser or diode (wavelength 810 nm)

Mechanism of laser

- Laser destroys avascular retina
- Removes ischemic stimulus
- Decrease neo-vascularization, fibrovascular proliferation
- Regression of ROP

Laser procedure



Pre-requisites

- Take consent
- Ensure good pupillary dilatation
- Nil by mouth 3 hours prior to the procedure
- Vital monitoring
- Radiant warmer for thermoregulation
- Arrange resuscitation equipment

Analgesia

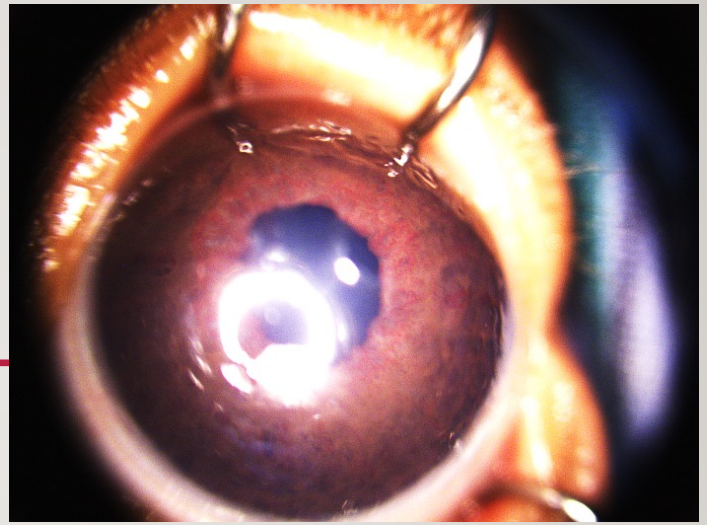
- Provision of oral glucose/dextrose
- IV fentanyl at 2 micrograms/kg bolus over 5 minutes f/b infusion of 2 micrograms/kg/hour *(maximum of 5 micrograms/kg/hour)*
- Titrate to pain scoring
- 15 minutes prior to the procedure followed till completion of procedure

Post laser follow up

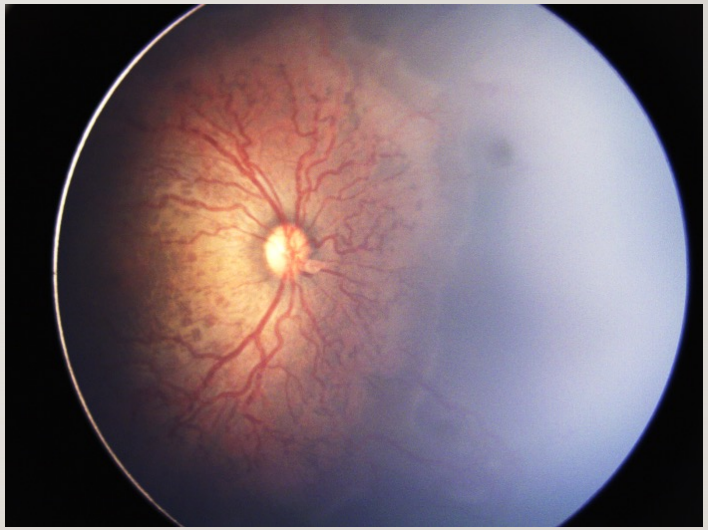
- Antibiotic/steroid + tears eye drops TDS for 5-7 days
- Follow-up **1 wkly** to observe ROP progression/regression
- Retreatment at 1 to 4 days when ROP fails to regress
- Review for laser augmentation in skip areas
- Long term follow up for retinal status and refraction

Anti VEGF drugs

- It is **not routinely recommended** in neonates with ROP
- **Indications**
  1. When laser photocoagulation fails
  2. As a pre-operative measure in Retinal detachment with high vascularity to reduce intra operative bleeding
  3. Zone I ROP where even the center of macula is not vascularised.



Iris neovessels with rigid pupil



APROP with severe plus disease

Anti-VEGF drugs

Benefits

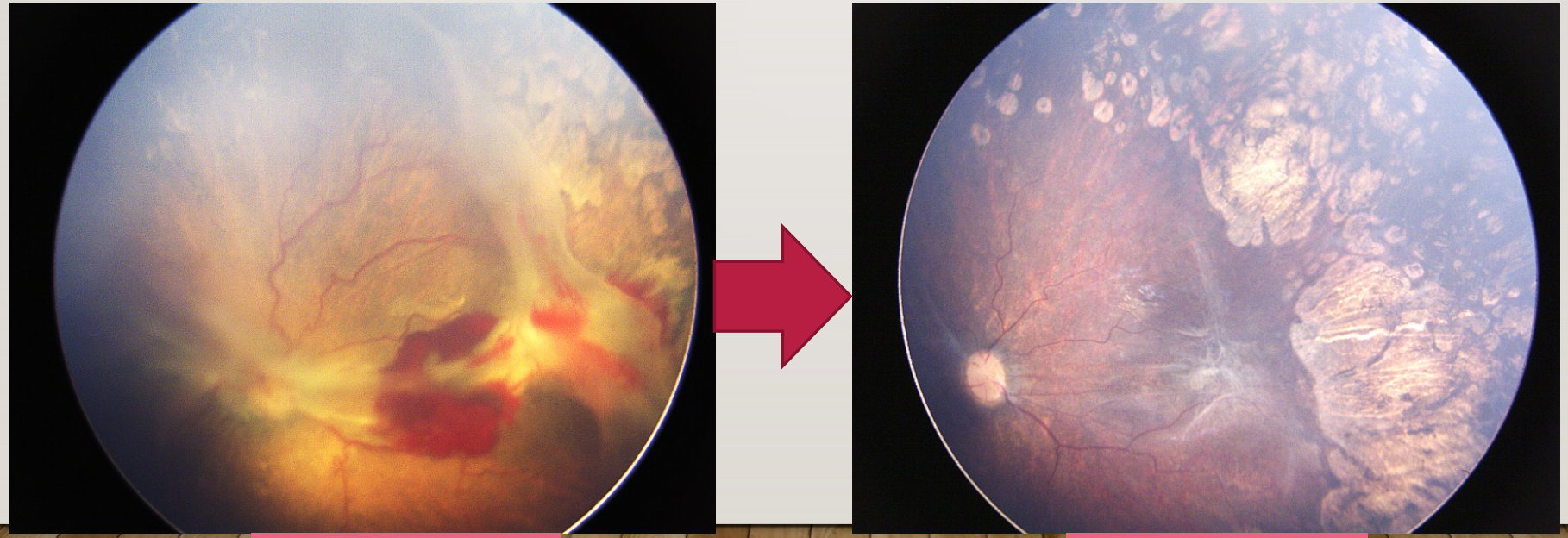
- Preservation of viable peripheral retina
- Reduction in level of anaesthesia required
- Reduced incidence of subsequent high refractive error

Concerns

- Dosage, timing, safety unclear
- No clarity on choice of drug
- Risk of systemic absorption
- Long term effect unclear
- Suppression of normal ocular and systemic VEGF level may affect normal growth
- Delayed recurrences

ROP Surgery

- Stage 4 ROP: Subtotal Retinal Detachment
- 25G/27G lens sparing vitreoretinal surgery - good outcomes

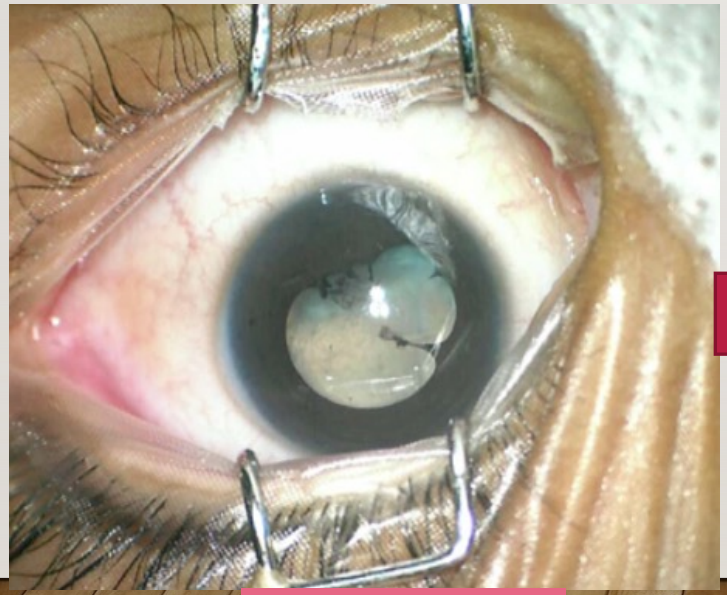


Stage 4B ROP

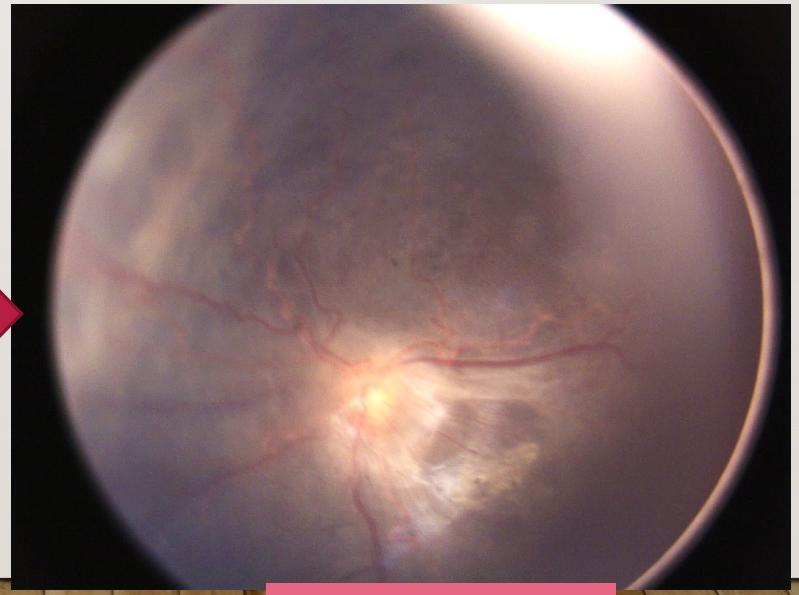
Postoperative

ROP Surgery

- Stage 5 ROP: Total retinal detachment (Poor prognosis)
- Surgical trial in hope of restoring navigable vision in bilateral cases



Stage 5 ROP



Postoperative

Prevention of ROP

Antenatal and delivery room

- Antenatal corticosteroids
- Delayed cord clamping
- Gentle respiratory management
- Maintaining temperature

Neonatal (POINTS to remember)

- **P**ain control
- **O**xygen management
- **I**nfection control
- **N**utrition
- **T**emperature control
- **S**upportive care

Deorari et al, Preventing sight-threatening ROP: a neonatologist's perspective. Community eye health 2017

Protect from medicolegal case

- Create robust system to screen eligible babies
- Documentation at discharge write, get signed
- Keep monitoring charts complete
- Liaison with ophthalmologist for screening & treatment
- Primary prevention is Best !

ROP

HOME OVERVIEW MODULES TEAM LOGIN

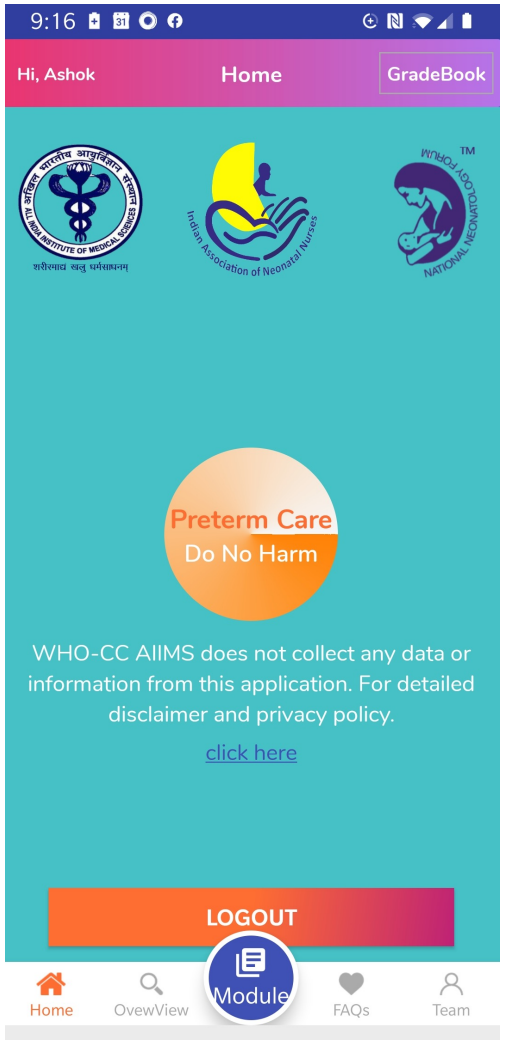
Facility-Based Care of Preterm Infant

Eliminating Retinopathy of Prematurity by Improving Quality of Care

LEARN MORE REGISTER NOW

THE QUEEN ELIZABETH DIAMOND JUBILEE TRUST

PUBLIC HEALTH FOUNDATION OF INDIA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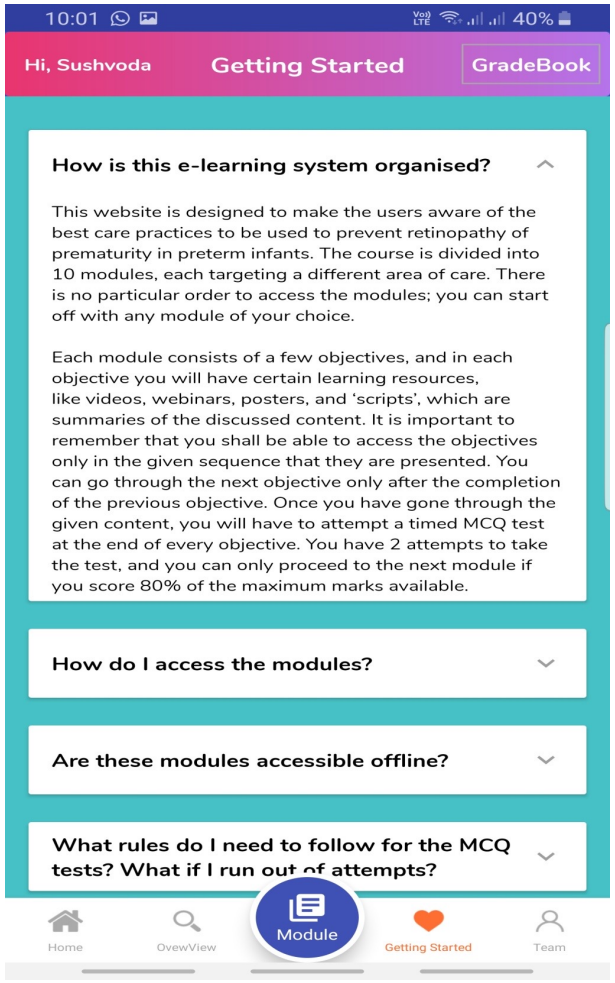
Hi, Ashok
Home
GradeBook
Preterm Care
Do No Harm
WHO-CC AIIMS does not collect any data or information from this application. For detailed disclaimer and privacy policy.
click here
LOGOUT
Home
OvewView
Module
FAQs
Team


Module
Thermoregulation
Kangaroo Mother Care
3
Optimal Oxygen Administration
4
Developmentally Supportive Care and Pain Management
5
Less Exposure to Blood Products and Prevention of Exchange Transfusion
6
Delivery Room Management and Stabilization of a Preterm Infant
7
Optimal Use of Continuous Positive Airway Pressure (CPAP)
8
Less Systemic Infections
9
Good Nutrition
10
Follow-up Care Pertaining to ROP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Hi, Sushvoda
Getting Started
GradeBook
How is this e-learning system organised?
This website is designed to make the users aware of the best care practices to be used to prevent retinopathy of prematurity in preterm infants. The course is divided into 10 modules, each targeting a different area of care. There is no particular order to access the modules; you can start off with any module of your choice.
Each module consists of a few objectives, and in each objective you will have certain learning resources, like videos, webinars, posters, and 'scripts', which are summaries of the discussed content. It is important to remember that you shall be able to access the objectives only in the given sequence that they are presented. You can go through the next objective only after the completion of the previous objective. Once you have gone through the given content, you will have to attempt a timed MCQ test at the end of every objective. You have 2 attempts to take the test, and you can only proceed to the next module if you score 80% of the maximum marks available.
How do I access the modules?
Are these modules accessible offline?
What rules do I need to follow for the MCQ tests? What if I run out of attempts?
Home
OvewView
Module
Getting Started
Team

Key messages

- ROP is a leading cause of PREVENTABLE childhood blindness
- ROP screening should be done at **4 weeks*** after birth
- Laser treatment for ROP is effective and has good outcomes
- Anti-VEGF not routinely recommended, adjunct to laser
- Multidisciplinary collaboration
- Follow up is crucial