GUIDELINE

Retinopathy of Prematurity (ROP) Screening, Treatment and Ophthalmology Consultations

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEHM, NICU PCH, NETS WA

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Aim

To outline the disease progression, screening and treatment options for Retinopathy of Prematurity (ROP).

Risk

Inadequate screening or delayed treatment of ROP can lead to vision impairment or blindness for the preterm infant.

Background

Retinopathy of Prematurity (ROP) is a disease of the eye in preterm infants, which results in the abnormal development of retinal blood vessels The most significant risk factor is extreme prematurity.

The retina in the eye starts to develop at 16 weeks gestation, when the blood vessels of the retina begin to form at the optic nerve. The blood vessels and retina gradually grow outwards (anteriorly). During the last 12 weeks of pregnancy the eye develops rapidly. When an infant is born full term, the development of the retina and its blood vessel growth are mostly complete. When an infant is born prematurely, the blood vessels and retina have not fully developed to the anterior extremity. The developing retina may not get enough oxygen and nutrients due to the under-developed blood vessel.

The avascular peripheral retina is thought to release signals, mediated by factors such as vascular endothelial growth factor (VEGF), to stimulate additional blood vessel formation.

This process leads to the growth of new blood vessels that are fragile and abnormal. These vessels can cause retinal scarring, and as the scar tissue contracts, it may cause traction on the retina, potentially resulting in retinal detachment. Retinal detachment is a major cause of visual impairment and blindness in premature infants.

Definition - International Classification of ROP (ICROP 3)

There are five stages of ROP

Stage of Acute Disease (Stages 1-3)

Stage 1: Demarcation Line. This is a thin but definite structure that separates the avascular retina anteriorly from the vascularised retina posteriorly.

Stage 2: Ridge. The ridges evolve with height and width from the demarcation line. It may vary in height and colour may appear from pink to white. Tufts of neovascular tissue may appear in isolation, called popcorn, posterior to the ridge.

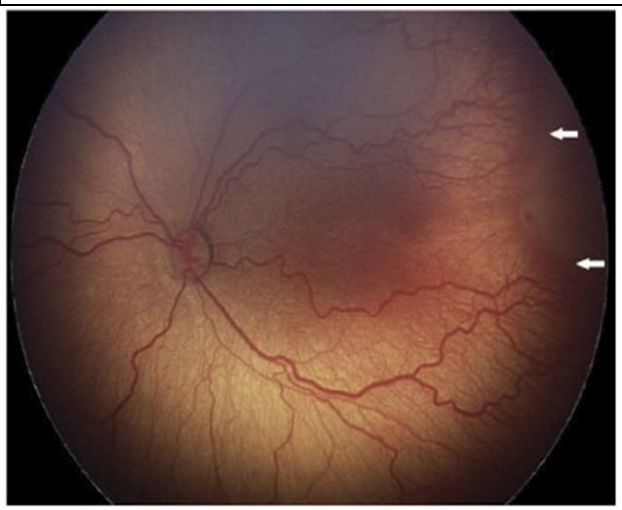
Stage 3: Extraretinal fibrovascular proliferation (or neovascularisation) extends from the ridge into the vitreous. Seemingly flat appearing extraretinal neovascularization can occur in eyes with Zone 1 or posterior Zone II disease, in the absence of an obvious ridge or demarcation is also considered stage 3 disease.

Aggressive Retinopathy of Prematurity (A-ROP)

Aggressive Retinopathy of Prematurity (A-ROP) is characterised by rapid growth of pathologic neovascularisation and severe plus disease without seeing the typical stage of ROP.

Plus Disease: refers to the increased venous dilatation and arteriolar tortuosity of the posterior retinal vessels. It is determined from vessels within Zone 1.

Pre Plus: represents a continuous spectrum of retinal vascular changes, when there are early vascular changes, but not severe enough to be called 'plus'.

Pre- Plus	**Mild Plus** **The white arrows represent a notch**
	

Vascular engorgement of the iris, poor pupillary dilatation, and peripheral vascular engorgement with vitreous haze are signs of advanced disease but are not necessary for plus disease diagnosis.

Retinal Detachment (Stages 4 and 5)

Stage 4: Partial Retinal Detachment.

- Stage 4A – Partial retinal detachment that does not involve the fovea.
- Stage 4B – Partial retinal detachment that involves the fovea.

Stage 5: Total Retinal Detachment.

- Stage 5A – The optic disc is visible by ophthalmoscopy.
- Stage 5B – The optic disc is not visible secondary to retrolental fibrovascular tissue or closed-funnel detachment.
- Stage 5C – Findings of stage 5B, plus anterior segment abnormalities (e.g. anterior lens displacement, marked anterior chamber shallowing, iridocapsular adhesions, capsule-endothelial adhesion with central corneal

opacification, or a combination thereof, suggesting a closed-funnel configuration descriptors of funnel configuration.

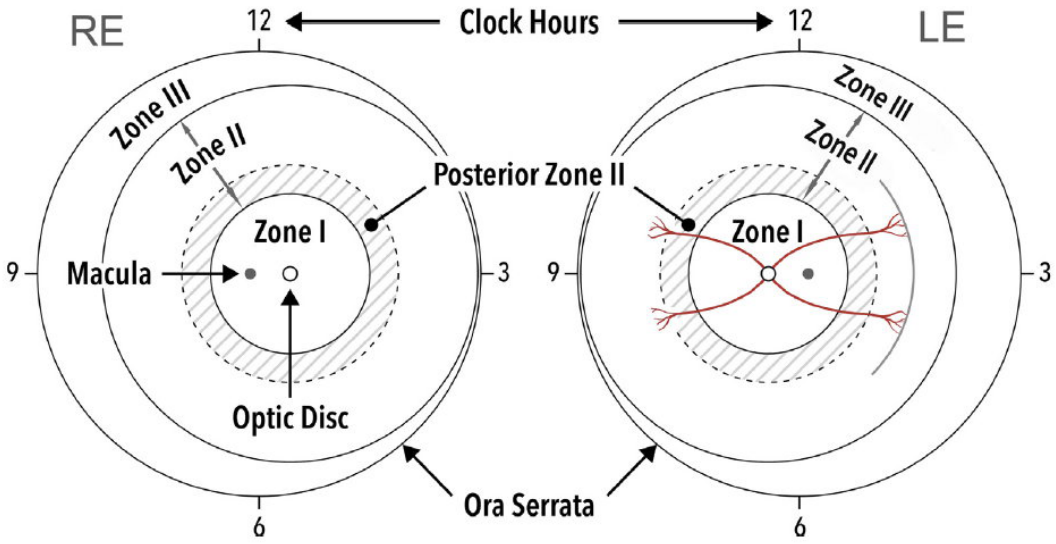
Mild ROP (Stage 1 or 2) is more common and tends to resolve spontaneously. A small number will worsen and progress into higher stages. Sometimes ROP can worsen very rapidly and destroy vision (Aggressive Retinopathy of Prematurity [A-ROP]). A-ROP can reach threshold treatment, without going through stage 1 or stage 2 ROP, within days.

Infants with ROP are also at increased risk of developing other eye problems later in life such as retinal detachment, myopia, strabismus, and amblyopia. In many cases these problems can be treated or controlled.

Other terminologies used in classification:

- **Notch** – in some cases, the demarcation line or ridge, instead of progressing in a circular fashion around the eye, it deviates in certain areas more posteriorly (see above). When staging ROP, it is recorded by the most posterior zone if retinal vascularisation, that is where the notch is located with the noting 'secondary to notch'
  - **Incomplete vascularisation** – accompanied but the zone of vascularization (e.g. incomplete vascularisation into Zone II) instead of 'no ROP' or 'immature retina'
  - **Regression** – disease involution and resolution. Regression may be complete or incomplete, including persistence of retinal abnormalities.
  - **Reactivation** – reoccurrence of acute phase features
  - **Long-Term Sequelae** – long term complications such as retinal detachment, persistent avascular retina, macular anomalies and retinal vascular changes and compilations.

Zones of ROP



Zone I is the small circle of retina around the optic disc The radius of Zone I is twice the distance from the macula to the centre of the optic disc.

Zone II is the ringed section surrounding Zone I, which extends to the Ora Serrata on the nasal side of the eye.

Zone III is the crescent shaped area of the temporal side of the retina.

Posterior Zone II is defined as a region of two-disc diameters anteriorly peripheral to the zone I border (shaded grey in the above drawing).

Risk Factors for Developing ROP

Prematurity < 31 weeks gestation	Resuscitation at birth
Low birth weight < 1250 grams	Multiple infections
Anaemia and Blood transfusions	RDS and prolonged ventilation
High levels of oxygen given to preterm infants is still an important risk factor and should be closely monitor at an agreed upon level by the medical staff.	

Screening Criteria

- All infants born <31 weeks gestation, regardless of weight.
- All infants born <1250 grams, regardless of gestation.
- Infants will be screened at 4 weeks of age but no earlier than 31 weeks corrected gestational age.
- Infants greater than 31 weeks gestation, born >1250g, with additional medical concerns, will be screened at the discretion of the consultant and require a special consultation request.
- Screening of infants born after 31 weeks (<1250g BW) should be at GA +4 weeks or 36 weeks, whichever is EARLIER, that is, no later than 36 weeks CGA
- At KEMH NICU imaging by the ROP team will be ceased at 44 weeks corrected gestational age (CGA) or if infant is >4500g. These infants will then be screened by the Ophthalmology team via a nurse escort to Perth Children's Hospital (PCH) Ophthalmology clinic or the Ophthalmology team will review infant at KEMH. The following exceptions may occur at the discretion of the Ophthalmologist if the infant:
    - has received anti VEGF injections at a later CGA age
    - has acute ROP and weight is >4500g.
- The follow up for infants that receive anti VEGF injections will be over a longer period and tailored to suit their individual needs.

Age at First Examination		
Gestation Age (GA) at Birth	Corrected GA (in weeks)	Age (in weeks)
22 weeks	31	9
23 weeks	31	8
24 weeks	31	7
25 weeks	31	6
26 weeks	31	5
27 weeks	31	4
28 weeks	32	4
29 weeks	33	4
30 weeks	34	4
> 31 weeks, < 1250g	must be seen prior to 35 weeks	3

Adapted from AL Jefferies; Canadian Paediatric Society

Discharge Planning and Transfer of Infants to Peripheral Hospitals

- Infants within the screening criteria should be flagged with the ROP screening team if transfer or discharge is approaching as all infants fitting the screening criteria, require a first review as an inpatient prior to transfer or discharge.
    - **EXCEPTIONS** – babies being transferred to Joondalup Health Campus (JHC), PCH or Fiona Stanley Hospital (FSH) where an ROP screening program is in place, or if care is being taken over by a private Ophthalmologist at selected private hospitals.
- For peripheral hospitals without an ROP Screening program in place, infants can only be transferred if they are able to be seen in the Ophthalmology clinic at PCH or at a ROP screening facility on the date prescribed by the Ophthalmologist.
- Low risk infants (> 30 weeks) can have their imaging session bought forward to allow for transfer or discharge. A priority outpatient appointment (OPA) will be made as per the Ophthalmologist request.
- Infants within the screening program, that have not yet been ordered a 3-month review, are to be imaged the week of discharge.
- Infants considered ‘safe’ by the screening Ophthalmologist after the 38-week CGA review, can be ordered a 3-4 month OPA at PCH.

- If these 'safe' infants remain as inpatients for > 4 weeks from the last date of imaging, the ophthalmologist is to be notified to see if repeat imaging is required prior to discharge.

ROP Imaging at KEMH

Medications (as per MR339)	
Dilacaine	• Dilacaine Eye Drops are used to dilate the pupil and allow for examination of the fundus of the eye. • If the infant shows signs of discomfort from ambient light in the nursery, a biliband may be applied for 3-4 hours or until the dilacaine has worn off.
Tetracaine	• Tetracaine Hydrochloride 0.5% Eye Drops (Amethocaine) is used to numb the eye and minimise discomfort prior to insertion of the eye speculum for ROP screening or eye examination.

- ROP imaging is conducted at the bedside by staff members trained in using the imaging equipment. Parents are welcome to be present for the procedure.
- Digital images of the retina are taken and sent to the Ophthalmologist for review via cPAS.
- The procedure itself is short and with minimal discomfort to the infant.
- If the images appear concerning, the ROP team will contact the Ophthalmologist immediately to review the images.
- The automated report is signed and returned with follow-up instructions.
- The signed report is printed and filed in the patient's notes.
- The neonatal team is notified by the ROP team of any change or concern and requested to communicate with the parents.
    - Any infant that has screening delayed due to instability, is to have the MR339 completed with documentation stating the reason why screening was not attended. The Ophthalmologist will be informed of the reasons why. If the infant will not be suitable for imaging for some time, the Ophthalmologist will need to see the infant in person for Binocular Indirect Ophthalmoscopy (BIO) screening.
- If an eye infection is present, a different speculum is used for each eye.
- Should the infant's clinical status deteriorate at any time, the procedure is immediately stopped. Continuing or rescheduling will depend on the infant's condition.
- Small red marks may be present on the infant's eye lids from the speculum; this usually resolves within 5-10 minutes.

ROP Imaging at Perth Children's Hospital (Ward 3B)

The process, criteria and considerations for screening are the same as KEMH. ROP imaging is attended weekly at PCH by the ROP Team. Nursing staff at 3B are informed the day before or morning off imaging so dilating drops can be administered and parents informed.

Signed reports are attached and sent via WA Health email to 3B CNC who place them in the clinical file at the patient bedside for upload into DMR. Medical staff are informed of the results, which they then discuss with the parents.

ROP Imaging of twins

In situations where one twin has been discharged home prior to the other, the discharged twin may return to either KEMH NICU or 3B PCH for ROP imaging alongside the inpatient twin, or in a suitable room equipped with appropriate medical equipment to ensure patient safety.

Imaging of discharged infants will only be offered whilst the infant remains within the gestational age and weight criteria for imaging.

The ROP Team will contact the parents to coordinate a suitable attendance time during designated screening hours.

The same process will be adhered to:

- MR339 Fundal Examination Record will be completed and signed by the medical team on duty prior to the procedure.
- Dilacaine eye drops will be administered in accordance with the ROP screening protocol.
- Documentation will be completed and returned to the ward clerk for uploading into DMR.
- The imaging report will be forwarded to the Ward 3B Clinical Nurse Specialist (CNS), with notification that the twin attended as an outpatient. The report will then be uploaded into DMR.

Any urgent or concerning findings will be communicated directly to the Ophthalmologist, who will initiate appropriate follow-up and management.

ROP Imaging on other PCH Wards

- When an infant who remains within ROP imaging criteria is transferred to another ward within PCH and ongoing screening is required, the ROP Screening Team will liaise with the ward manager and the medical team responsible for the infant to notify them of the screening requirement and the anticipated screening week.
- On the day of screening, the ROP coordinator will be contacted to arrange an appropriate time for imaging on the receiving ward.

- An MR339 Fundal Examination Record may be retrieved from or sent down by Ward 3B for pre-prescription of eye drops.
- It is the responsibility of the bedside nurse to ensure the MR339 form is signed by the medical officer prior to administering Dilacaine drops and before the ROP Team arrives.
- The infant will be prepared by the ROP Team in accordance with standard imaging protocols above.
- For any urgent or concerning findings, the ROP Team will contact the ophthalmologist to review. The ROP team will ensure the infant's medical team are notified of any escalation and treatment needed.
- The imaging report will be forwarded the following day to the ward manager for inclusion in the infant's bedside notes and uploading into DMR.

ROP Screening at Joondalup Health Campus (JHC)

ROP Imaging at JHC is attended weekly by the ROP Team with the use of portable ROP. Criteria and considerations for screening are the same.

JHC is contacted early in the week to highlight the infants that require ROP Imaging and to discuss discharge planning.

JHC is then contacted the morning of screening with an approximate time of arrival so that dilating drops can be administered and parents informed.

Reprocessing of ROP Lens

Medical devices coming into contact with mucous membranes such as the conjunctiva of the eye must undergo High Level Disinfection (HLD) during reprocessing and follow the CAHS Tracking and Traceability of Reusable Medical Devices Procedure.

ROP staff are trained in reprocessing the reusable retinal lens and speculum devices. Training includes a step by step competency package aligned to ***AS/NZS 5369:2023 Reprocessing of reusable medical devices and other devices in health and non-health related facilities***.

Treatment Options for ROP

1. Laser Therapy

The most effective treatment for ROP is laser therapy, this burns away the avascular periphery of the retina. This reduces the production of VEGF, which is the driving factor for abnormal growth of blood vessels, which in turn reduces the risk of tractional retinal detachment. Laser therapy is indicated in Type 1 ROP, as defined by the ET-ROP trial. In brief, Type 1 ROP refers to any ROP with Plus disease, and Stage 3, Zone I without Plus.

All infants requiring laser treatment will require ongoing follow up and will require the Ophthalmologist to clear them for discharge or transfer to peripheral hospitals.

Laser therapy is conducted at Perth Children's Hospital. Infants at KEMH are transferred to PCH 3B for treatment.

Pre-Operative Care

Follow routine pre-operative care

- Pre-operative bloods are not a routine requirement for this procedure. An IV is usually inserted on the ward prior to theatre.
- Fast for 3 hours (for EBM/BF) or 4 hours (for formula).
- Instil one drop of Dilacaine into each eye every 30 minutes for two hours prior to time of surgery to dilate the pupil.

Post-Operative Care

Follow routine Post-Operative Care.

- Connect to a cardio-respiratory monitor on return from theatre. Hourly observations - TPR and BP hourly for 4 hours, then 4 hourly for 24 hours.
- Check MR842 operation summary for specific post-operative orders.
- Feeds can be recommenced once the infant is awake and indicated
- ROP imaging will recommence one week post laser.
- Ophthalmology follow-up as an outpatient will be required on discharge.

2. Anti-VEGF Injections

Vascular Endothelial Growth Factor (VEGF) is produced by the avascular anterior peripheral retina in infants with ROP. VEGF is the driving factor for abnormal growth of blood vessels in the developing retina, and these abnormal blood vessels may cause tractional retinal detachment and blindness.

An intravitreal injection of Anti-VEGF (VEGF inhibitor) can be used to inhibit the production of VEGF when deemed suitable by the Ophthalmologist, or the disease is too posterior to allow laser to be done safely without risking damage to the macula or other significant visual structures.

Ranibizumab (Lucentis®) is the anti-VEGF used by the Ophthalmologists. One vial of Ranibizumab is needed per eye. The ROP team will contact pharmacy, preferably with 24 hours' notice, to order.

Parental consent is required by the Ophthalmologist. MR840.03 Consent to treatment and administration of anaesthetics.

The procedure is quick and conducted by an Ophthalmologist It involves injecting the medication into the vitreous space under aseptic conditions. Refer to Appendix 1: VEGF Inhibitor Procedure.

Chloramphenicol 0.5% is routinely prescribed for 5-7 days after injection.

All infants requiring treatment with VEGF inhibitors will require ongoing follow up as inpatients and post discharge. A fluorescein angiogram will be arranged approx. 6 months after the injection.

Anti-VEGF Injections on other wards at PCH

- When anti-VEGF injections are required on a ward other than KEMH and Ward 3B, the ROP Team will notify the relevant medical team in conjunction, ward manager, and shift coordinator of the screening results and the need for treatment.
- The ward medical team is responsible for ensuring the Ranibizumab medication is prescribed.
- The ROP Team will instruct the ward Manager/Shift Coordinator to send a photocopy of the completed medication chart to PCH Pharmacy to arrange delivery of **two vials** of Ranibizumab to the infant's ward.
- The ROP Team may not always be available to assist with anti-VEGF injections on other wards; however, support will be provided where staffing and availability permits. There is an Anti-VEGF procedure kit stored on ward 3B that may be collected by the ROP team or sent to the ward where the injection will take place by the Ophthalmologist.

Ophthalmology Special Consultations

- For any ophthalmic reviews not related to ROP, an e-referral must be completed.
- The on-call Ophthalmology Registrar at PCH is to be phoned by the NICU medical staff, requesting a special consultation and an E-referral to be completed to Ophthalmology.
- If ROP imaging is warranted, the Ophthalmology Registrar will inform the NICU medical team, who will then inform the ROP team.

Related CAHS internal policies, procedures and guidelines
Tracking and Traceability of Reusable Medical CAHS CSSD Policy Reprocessing of reusable medical devices (WNHS Infection Prevention and Management Policy) Neonatology Medication Protocols: • Chloramphenicol 0.5% • Dilacaine Eye Drops • Ranibizumab • Tetracaine Hydrochloride 0.5% Eye Drops (Amethocaine) Neonatology Guidelines: • Pre-Operative Care and Post-Operative Care

References

1. AL Jefferies; Canadian Paediatric Society. Retinopathy of prematurity: Recommendations for screening. Paediatr Child Health 2010;15(10):667-0. http://www.cps.ca/documents/position/retinopathy-of-prematurity-screening
2. Am Academy of Ophthalmology. International Classification of Retinopathy of Prematurity, Third Edition. Ophthalmology 2021 https://doi.org/10.1016/j.ophtha.2021.05.031
3. Brian W. Fleck and Neil McIntosh. Retinopathy of Prematurity: Recent Developments
4. Good, W V. Final results of the early treatment for the retinopathy of prematurity (ETROP) randomized trial. Tans Am Ophthalmol Soc. 102: 233-50, 2004.
5. Mintz-Hittner, H A. Kennedy, K A. & Chuang A Z. Efficacy of Intravitreal Bevacizumab for Stage 3+ Retinopathy of Prematurity | New England Journal of Medicine 364(7):603-15, 2011
6. National Eye Institute & National Institute of Health. Retinopathy of Prematurity (ROP) Resource Guide. Retinopathy of Prematurity | National Eye Institute
7. Screening of retinopathy of prematurity (ROP) - clinical guideline | RCPCH
8. Tristel Duo OPH | Ophthalmic Device Disinfectant
9. Reprocessing of reusable medical devices | Australian Commission on Safety and Quality in Health Care (AS/NZS 5369:2023)[

This document can be made available in alternative formats on request.

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Appendix 1: Vascular Endothelial Growth Factor (VEGF) Inhibitor Treatment

- Ranibizumab needs to be charted on the front of the medication chart by the medical team. A photocopy of the front of the medication chart should then be sent down to pharmacy so that they can dispense the medication. One vial per eye of Ranibizumab is required.
- A prepacked box with some of the equipment listed below is available in the ROP Office (BG15). Sterile gloves (Prof Lam size 7), gowns, theatre hat and surgical masks are required for the Ophthalmologists.
- Document on Retinopathy of Prematurity Fundus Examination Record (MR 339)

Equipment (Procedure Trolley and a sterile field is required)

- BD Microlance 30G needle
- 1 x 10mL syringe
- 1 x 2mL syringe
- 2 x 1mL syringes
- 2 x Alfonso eye speculum (reusable) or Blink (disposable specular)
- Calliper and rule x 2 (reusable)
- 1x Dressing pack
- Packet sterile gauze
- 1x Sterile cotton tips
- 10 mLs water for injection
- Povidone-Iodine 10% w/v 100mL
- Chloramphenicol drops
- Tetracaine drops (Amethocaine)
- Ranibizumab (Lucentis ®)2 x boxes (x1 vial per eye)
- x1 Huck towel

Procedure Steps

1. Ranibizumab drawn up by the Ophthalmologist in the 1mL syringe under sterile conditions with filter drawing up needle (that comes in the boxes with the Ranibizumab).1 syringe per eye
2. Position infant supine, swaddle and provide sucrose. Place Huck towel under the infant's head. Infant **must be still for the procedure**. ROP team member or Bedside Nurse to hold the infant securely whilst Tetracaine administered. Active sucking on a dummy with sucrose is beneficial.
3. Dilute 10mLs of Povidone-Iodine with 10 mLs water for injection. Half Strength Povidone-Iodine applied to ocular area.
4. Speculum inserted by Ophthalmologist and injection site measured with calliper and rule.
5. Ranibizumab injected by the Ophthalmologist into the vitreous space. Cotton tip applied to injection site by Ophthalmologist if required.
6. Repeated in the other eye (if prescribed).
7. Eye washed with 1ml of half strength Povidone-Iodine post injection.
8. Chloramphenicol 1% drops applied to both eyes. The Ophthalmologist will write in the medication chart for the drops to be given QID for 5 days.