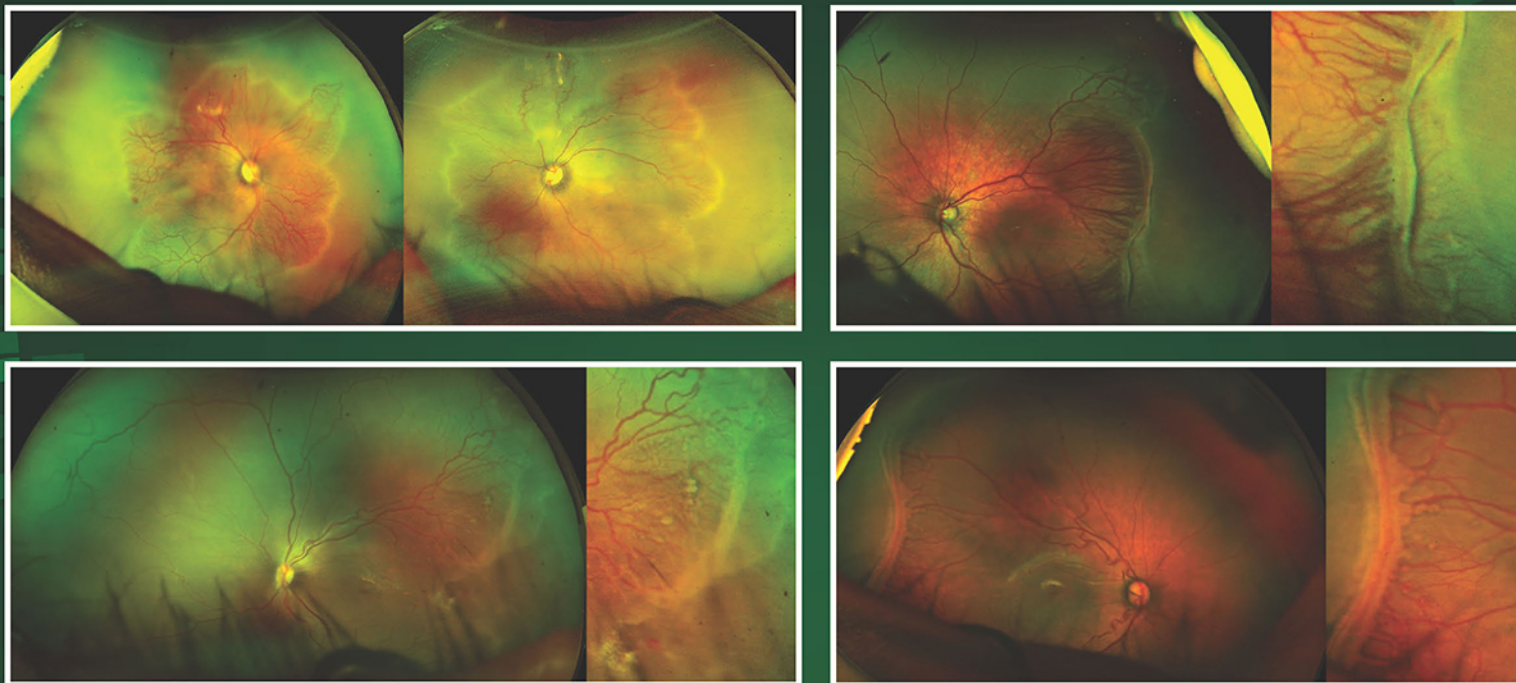


# Ultra-Wide Field Photography Atlas of Retinopathy of Prematurity



**Sushma Ratna Jayanna**

*Foreword*  
**Subhadra Jalali**



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# Ultra-Wide Field Imaging Technique in Infants

## ■ INTRODUCTION

The importance of documentation of fundus findings in retinopathy of prematurity (ROP) in today's era cannot be emphasized enough. It has proven to be a great tool for retinal specialists in the objective assessment of the findings, educating the trainees, and counseling of the parents.

A few of the commonly used fundus imaging modalities in ROP include RetCam (Clarity Medical Systems, Pleasanton, CA, USA) and Neo Forus (Bengaluru, India) with a limited field of imaging (130°). Ultra-wide field (UWF) photographs (Optos, Dunfermline, UK) which are mainly used for adult retinal pathologies, have been also tried in babies and have proven to be safe, efficient, and fast in everyday clinical practice. The significant advantage of UWF over other modalities is the noncontact camera and wider field of view (anteroposterior 200° field), which can be achieved in one capture. The confocal scanning laser ophthalmoscopy system in UWF cameras has less scattering of light and helps in obtaining a clearer image. An image size of 20 Mb can be captured in a quarter of a second. A special position, called the *flying baby* is adopted which is different from the conventional lying down position, to capture images using UWF cameras in babies under topical anesthesia.

It is at times challenging to image preterm infants as they usually will have systemic comorbidities and it is crucial to keep in mind the red flag signs, such as baby turning blue, change in tone of crying, sudden stoppage of cry, regurgitations and distension of abdomen, respiratory distress, feeding tubes, and apneic spells. Such babies need constant monitoring of vitals throughout the procedure and ideally, in order to have a standby pediatrician or a neonatal anesthetist.

This atlas comprises UWF photographs of various presentations and stages of ROP captured in an outpatient department (OPD) set-up of the LV Prasad Eye Institute, Hyderabad, India. All images were taken by trained technicians, on Optos UWF scanning laser ophthalmoscope camera Panoramic 200Tx imaging system (Optos PLC, Dunfermline, UK).

## ■ IMAGING TECHNIQUE

A written parental consent is obtained. A detailed history is taken in the OPD. Pupil dilatation is done using tropicamide (0.8%) and phenylephrine (2.5%) with instillation of one drop every 10 minutes for 30 minutes. Care must be taken to wipe out the excessive spillover of the drop to prevent systemic absorption through the skin.

Examination of the dilated fundus by the retinal specialist using a binocular indirect ophthalmoscope (BIO) and 20 diopter lens in a dimly lit room and grading of the disease is documented in the case sheet. Baby needs to be fed and burped at least half an hour before the procedure. The baby should

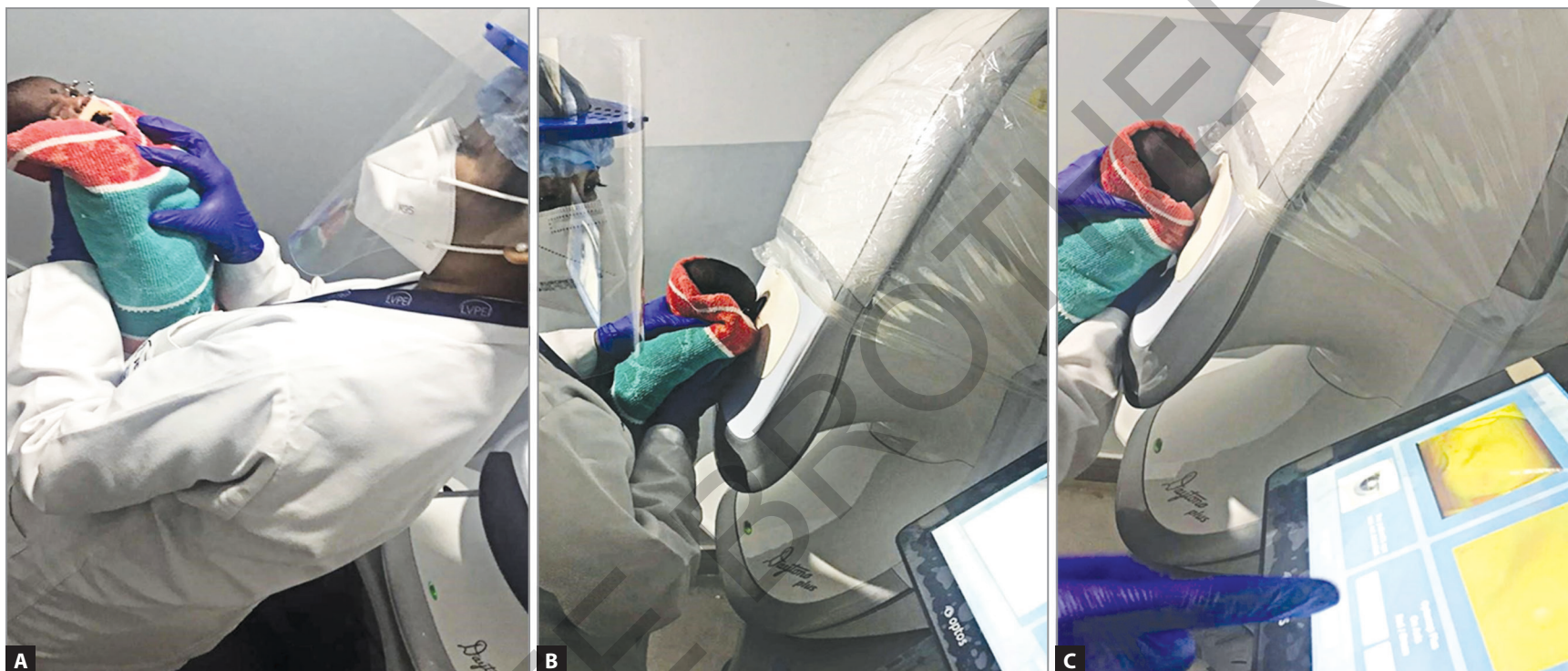
be wrapped well with a warm clean cloth sheet, which helps in easy handling. Proparacaine 0.5% eye drops is used as a topical anesthetic agent, instilled before inserting a sterile pediatric lid speculum to retract the eyelids.

### ■ MODIFIED FLYING BABY POSITIONING

Technicians who are well versed in imaging adults and especially trained for 4–6 weeks, in handling preterm babies are involved. It requires a minimum of two of these technicians.

During the procedure, one arm of the trained technician supports the chest and the chin of the baby with the other hand supporting the head. Pupils are aligned by moving the head, with the movement of the eye guided by visual feedback on the monitor. After optimal positioning of the eye, images are captured by a second trained technician. The time taken for capturing the image after alignment is approximately 3 seconds. The Optos camera consists of a removable camera aperture of different sizes. A bigger aperture is used in small babies; a smaller aperture is used in bigger babies as it is easy to achieve alignment. In very tiny babies, eye alignment is easier without using any aperture, as the aperture could itself induce artifacts and shadowing.<sup>1</sup>

## MODIFIED FLYING BABY TECHNIQUE



**Figs. 1A to C:** Modified flying baby positioning. (A) The baby is wrapped with warm clean clothes and a sterile speculum is inserted after topical anesthesia; (B) One arm of the technician supports the chest and the chin of the baby and the other hand supports the head. Pupils are aligned by moving the head, with the movement of the eye guided by visual feedback on the monitor; (C) After optimal positioning of the eye, images are then captured by a second trained technician.

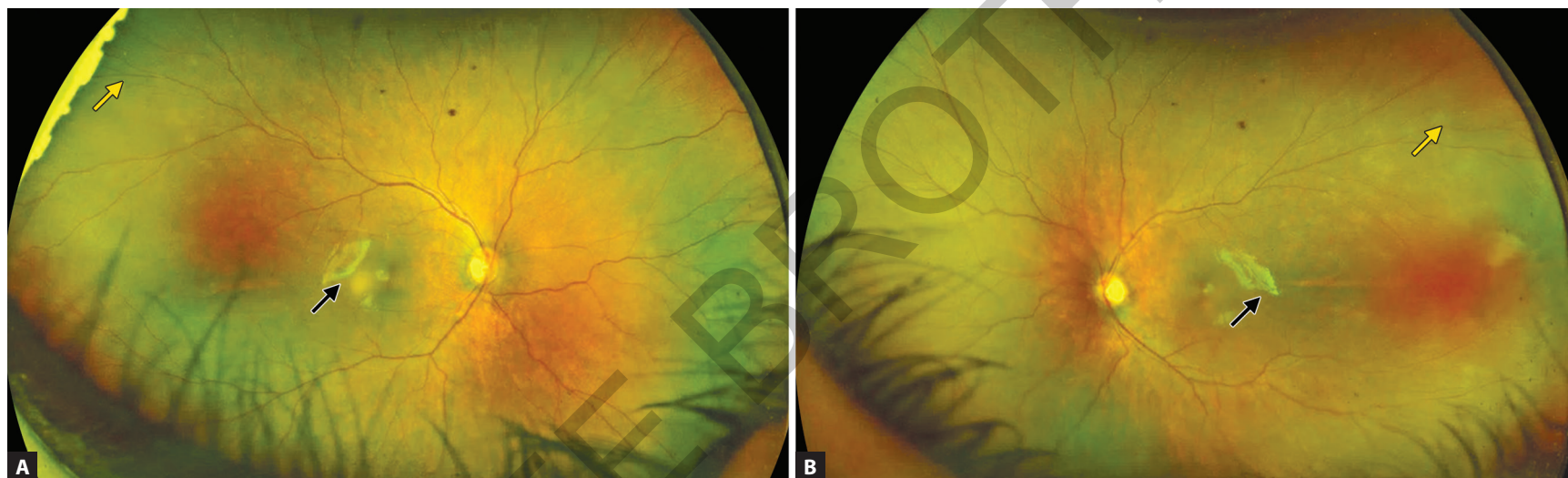
**MODIFICATION TO THE EXISTING APERTURES OF OPTOS**

**Figs. 2A to C:** (A) Removable camera aperture of different sizes; (B) In very tiny babies, images are captured without using any aperture; (C) Aligning the pupil by moving the head with help of visual feedback monitor.

## ■ RETINA IN NEWBORN PRETERM BABY

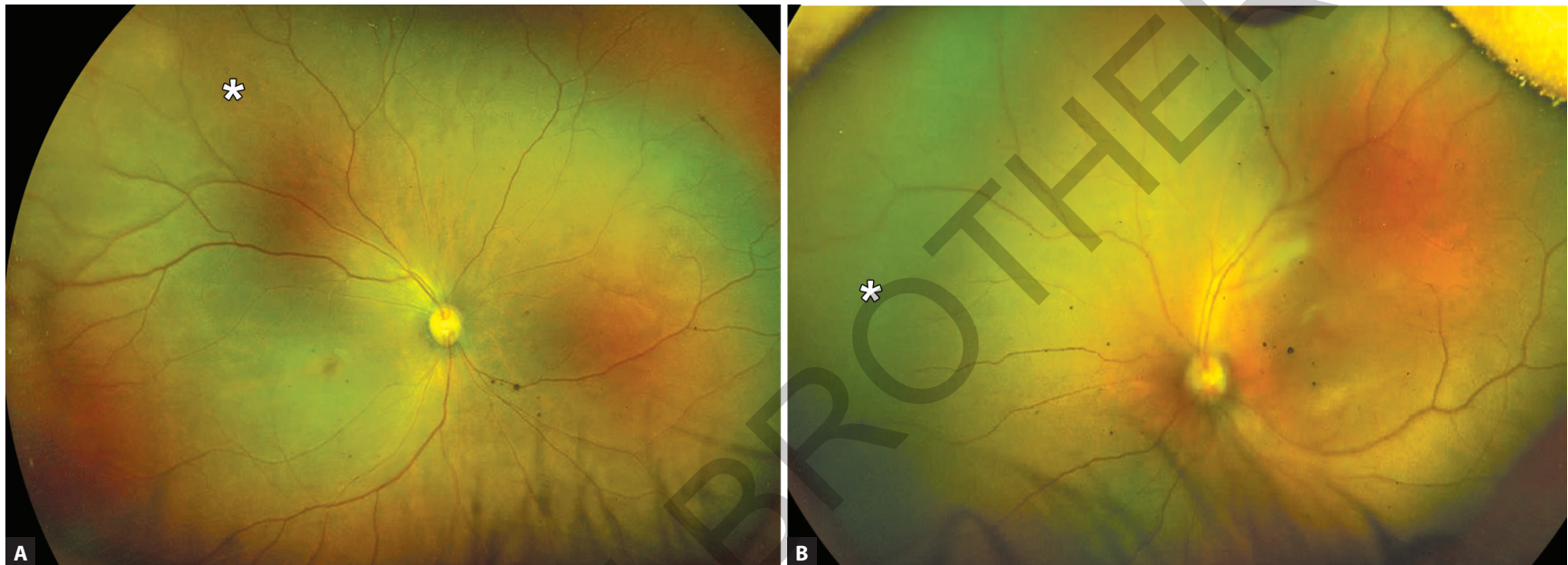
Retinal vascularization starts in utero during 16 weeks of gestational age (GA) with vessels reaching the nasal side of the ora serrata by 36 weeks and the temporal side by 40 weeks, just before the birth of term baby. A mature retina in a newborn term baby appears completely vascularized with normal dichotomously branching vessels reaching up to the zone III anterior till the ora serrata.<sup>2</sup> Premature infants will have incompletely vascularized retina in the periphery, with either major retinal vessels in the affected zone or a complete avascular peripheral retina at birth.<sup>2</sup>

### Both Eyes Mature Retina



**Figs. 3A and B:** OU UWF fundus images of baby with 41 weeks postmenstrual age, 28 weeks gestational age and 2.5 kg birth weight with mature retina, normal dichotomously branching retinal vessels till zone III anterior (yellow arrows). Both the images show reflection artefact (black arrows). (OU: both eyes; UWF: ultra-wide field)

### Both Eyes Immature Retina Zones II and III



**Figs. 4A and B:** OU UWF fundus images of baby with 36 weeks PMA, 28 weeks GA and 900 g of BW showing immature retina (asterisks) with the presence of only major vessels in zones II and III. (BW: birth weight; GA: gestational age; OU: both eyes; PMA: postmenstrual age; UWF: ultra-wide field)

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# Ultra-Wide Field Photography Atlas of Retinopathy of Prematurity

This atlas focuses on scanning laser ophthalmoscopy based high-resolution ultra-wide field color fundus images of retinopathy of prematurity (ROP). It depicts various common and uncommon presentations and treatment response of the disease. Its salient features include:

**Broad Applicability:** The atlas is versatile in its application, catering to both educational and communicative needs within the healthcare field including:

- ROP trainees, as an educational tool to simplify their understanding of ROP
- Parents, nurses, neonatologists, pediatricians, and health-media communicators to comprehend the significance of the disease.

**Highlights Techniques and Safety:** The atlas includes guidance on the effective and safe techniques for capturing retinal images in preterm babies. It educates users on potential artifacts that may be encountered during interpretation and emphasizes the importance of being cautious in such cases.

**Visual and Textual Integration:** The combination of high-resolution retinal images and explanatory text enhances the learning experience by providing a comprehensive understanding of the disease. Every retinal image in the atlas is complemented by text legends that provide essential information on clinical context and interpretation.

**Sushma Ratna Jayanna** MBBS DNB FICO is currently working as a Vitreo-Retina Surgeon and Faculty In-charge of ROP Services at Shantilal Shanghvi Eye Institute (SSEI), Mumbai, Maharashtra, India. Before joining SSEI, she worked as Retina Faculty at LV Prasad Eye Institute, Hyderabad, Telangana, India, and has substantial international work experience as Retina Faculty across the continent including Liberia Eye Centre, John F Kennedy Hospital, Monrovia, Liberia, West Africa and at Jigme Dorji Wangchuk National Referral Centre, Thimphu, Bhutan. Pediatric retinal pathologies including ROP and imaging, remains her main area of interest and has published several original articles, review articles on ROP, pediatric retinal imaging and have given podium presentations at various national and international conferences. She is a Recipient of the prestigious Professor Yasuo Tano Travel Grants Award, Asia Pacific Vitreo-Retina Society (APVRS) in 2019 and was one of the Mentees in Leadership Development Program, APVRS in 2023.



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