RETINOPATHY OF PREMATURITY – AN IMPORTANT CAUSE OF CHILDHOOD BLINDNESS

Sadia Sethi, Mohammad Junaid Sethi, Mohammad Daud Khan

Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar.

Retinopathy of prematurity is a vasoproliferative retinopathy which occurs principally, but not exclusively in premature infants[1].

Retinopathy of prematurity (ROP) is becoming an important cause of blindness in children in some newly industrializing countries, and in urban centres of some moderately developed countries where neonatal intensive care services are being introduced. (Fig. 1) Neonatal care units are present all over Pakistan. To our knowledge there is no screening programme in place for Retinopathy of prematurity in Pakistan.. There are internationally accepted standard definitions for screening of disease, its stages and effective therapy. This article focuses on all of them with an aim to create awareness among the ophthalmologists, so that an initiative towards screening for retinopathy of prematurity may be taken.

HISTORICAL PERSPECTIVE AND REGIONAL VARIATION

The condition was first reported by Theodore Terry in 1942 from Texas in a six month old premature infant who had greyish white vascular membrane behind each lens. One eye was enucleated to rule out retinoblastoma. The histopathology showed that the retina was incorporated in the fibrous tissue behind lens and hence it was called retrolental fibroplasia[2]. In the following decades, Campbell[3] and Petz[4] noted the association between this entity, which then became a prominent cause of childhood blindness and a high concentration of administered oxygen. The first randomized prospective study carried out by Kinsey clearly established that the incidence of ROP was inversely proportional to the birth weight[5]. Ashton postulated that normally retinal vascular development begins in 16th week of gestation. The mesenchyme grows centrifugally from optic disc, reaching the nasal ora serrata in 8th month of gestation, and temporal ora upto 1-2 months later. Premature birth may trigger the onset of ROP in which normal retinal vascular development is arrested and abnormal neovascularization occurs[6].

Using a standard method and reporting form, data is available from 4,269 children with severe visual impairment and blindness from 27 countries and is shown in the figure 1 below:

SCREENING GUIDELINES FOR RETINOPATHY OF PREMATURITY AT UNIVERSITY OF MIAMI SCHOOL OF MEDICINE AT THE BASCOM PALMER EYE INSTITUTE

PROPORTION OF CHILDHOOD BLINDNESS DUE TO ROP IN DIFFERENT COUNTRIES

(Data from blind school studies by London School of Hygiene and Public Health 1990-1996)

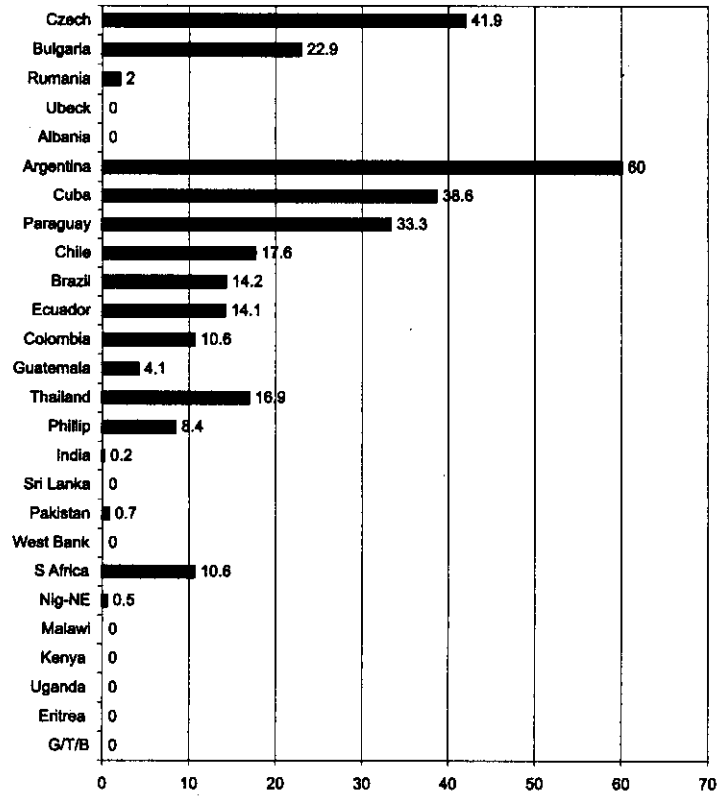

Fig. 1

The following Screening guidelines for retinopathy of prematurity are used at University of Miami school of medicine at the Bascom Palmer Eye Institute:

- All infants with birth weight < 1300 gm
- All infants with birth weight 1301 – 1800 gms if oxygen is given for > 48 hours.
- All same birth siblings of children meeting above criteria.
- First examination 32 to 34 weeks post-conceptional age.
- Drops technique: punctal occlusion for all agents
- 0.5% proparacaine
- 0.5% cyclopentolate
- 2.5% phenylephrine
- No feeding for 1 hour before examination. Feedings may proceed immediately after examination.

Subsequent examinations at 1 to 2 week intervals, dictated by disease staging and severity.

The clinical manifestations of retinopathy of prematurity rarely occur before 32 weeks gestational age. Disease activity rarely lasts beyond 42 weeks. Thus, a short window of time exists in which the disease develops, matures and completes its course.

INTERNATIONAL CLASSIFICATION OF ACUTE STAGES OF RETINOPATHY OF PREMATURITY

A revised classification for ROP was introduced in 1984, which takes into account both the severity (Stages I—V) and extent of the disease (Zone 1—3) and is as follow:

Location – Three zones, all centered on optic disc

Zone I (posterior pole) – Circle with radius of 30°, twice disc-macula distance

Zone II – From edge of zone 1 to point tangential to nasal ora serrata and around to area near the temporal equator

Zone III – Residual crescent anterior to zone II

Extent—specified as hours of the clock as observer looks at each eye

Staging the disease

Stage 1— Demarcation line between vascularised central retina, and peripheral avascular retina

Stage 2— Ridge between vascularised central retina, and peripheral avascular retina

Stage 3— Ridge with extraretinal fibrovascular proliferation
Mild fibrovascular proliferation
Moderate fibrovascular proliferation
Severe fibrovascular proliferation

Stage 4— Subtotal retinal detachment

A. Extrafoveal

B. Retinal detachment including fovea

Stage 5— Total retinal detachment

Funnel:	Anterior	Posterior
	Open	Open
	Narrow	Narrow

Plus disease – Plus (+) is added when vascular shunting is so marked that the veins are enlarged and the arteries tortuous in the posterior pole.

Threshold disease is stage 3 + ROP in zone I or II, involving at least 5 contiguous clock-hour sectors or at least 8 interrupted clock-hour sectors.

EXAMINATION SCHEDULE FOR PREMATURE INFANTS. (Birth weight < 1500 G)

The following is the examination schedule for all premature infants with birth weight less then 1500 gms. (Fig. 2)

STRATEGIES FOR PREVENTION OF BLINDNESS FROM ROP

Primary Prevention:

- Prevent preterm birth – good antenatal care.
- Systemic steroids prior to preterm birth.
- Very good neonatal care with monitoring of blood gases
- Surfactants

Secondary Prevention:

- Screening of preterm babies by ophthalmologists
- Treatment with cryotherapy or laser of babies with Stage III "plus" disease

Tertiary prevention:

- Low vision services / special education
- Scleral buckling and sophisticated vitreoretinal surgery to treat stage 5 of ROP.

The multicentre Cryotherapy for ROP trial (CRYO - ROP) was done in 23 centres in USA. and recruited a prospective cohort of 4099 infants with birth weight less than 1251 grams. The study showed that incidence and severity of ROP were related to birth weight and gestation. Cryotherapy for Retinopathy of prematurity (CRYP-ROP)

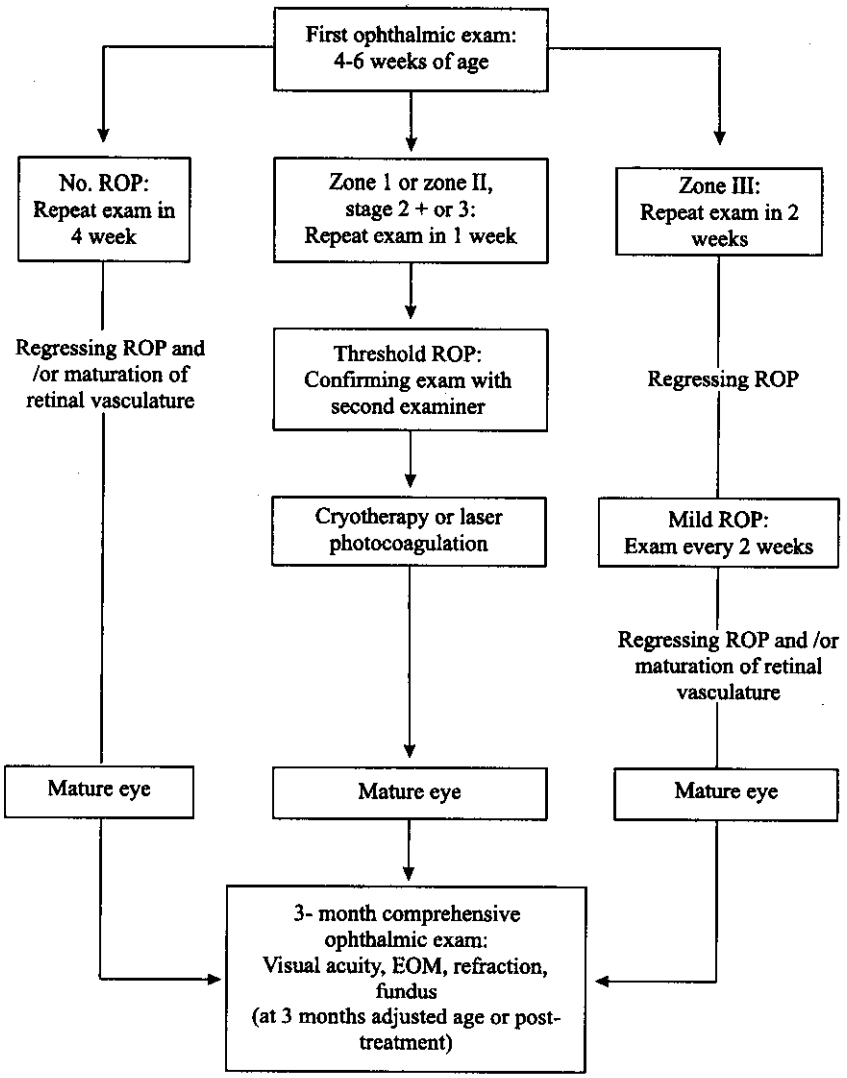

Fig. 2

treatment guidelines for threshold disease showed that cryotherapy should be done for the following cases.[8,9]

- Plus disease
- Stage III disease
- ≥5 contiguous clock hours
- ≥8 noncontiguous clock hours

All cases should be treated within 72 hours of examination that has documented these measures.

Laser photocoagulation is especially advantageous in zone I disease, where cryotherapy is technically difficult. Laser treatment is less irritating, technically easier to perform, and the scars are less pronounced[10] and more discrete compared to cryocoagulation. Moreover, laser therapy avoids the need of conjunctival incision for zone I ROP as well as the intense scleral depression required with the cryoprobe. In some cases treatment of the most anterior

retina with laser is difficult where cryotherapy is more helpful. Recently, Diode laser is used which is as effective as cryotherapy and has the added benefit of reducing myopia in the treatment of ROP[11].

SEQUELE OF ADVANCED RETINOPATHY OF PREMATURITY

Serious sequel of ROP include retinal detachment, retinal folds involving the macula and macula ectopia. In a New Zealand population study, 79% of children who developed ROP and 60% of children who were at risk but didn't develop ROP, had some form of visual defect (high refractive error, strabismus or amblyopia)[7]. If ROP does occur, the risk of subsequent high refractive errors is greater in eyes that develop threshold ROP, or cicatricial changes, than in less severely affected eyes. Premature infants are more likely to have deficits in colour vision (blue-yellow), contrast sensitivity and field defects (especially if there is cerebral damage), than infants born at term. Therefore ex-premature children, especially those in whom ROP developed and either regressed or was treated, should be followed regularly through childhood so that their potential visual problems do not go undetected. Microphthalmos, cataract, glaucoma and phthisis bulbi are associated with stage 5 of ROP.

REFERENCES

1. Terry TL. Extreme prematurity and fibrovascular overgrowth of persistent vascular sheath behind each crystalline lens. Am J Ophthalmol 1945;125: 203
2. Flynn JT. Acute proliferative retrolental fibroplasia: Evolution of the lesion. Graefes Arch Klin Exp Ophthalmol 1975; 195: 101.
3. Campbell K. Intensive oxygen therapy as a possible cause of retrolental fibroplasia: A clinical approach. Med J Aust 1951; 2: 48.
4. Patz A, Hoeck LE, De La Cruz E. Studies on the effect of high oxygen administration in retrolental fibroplasia: Nursery observation. Am J Ophthalmol 1952; 35: 1248.
5. Kinsey VC, Arnold AJ, Kalina RE, et al. PaO_2 levels and retrolental fibroplasia: A report of the co-operative study. Paediatrics 1977; 60: 655.
6. Ashton NW. Oxygen in growth and development of the retinal vessels. Am Jr Ophthalmol 1966; 62: 412.
7. Darlow B, Clement R, Horwood L, Mogridge N. Prospective study of New Zealand infants with birth weight of less than 1500g and screened for retinopathy of prematurity: visual outcome at age 7-8 years. Br J Ophthalmol 1997; 81:935.
8. Cryotherapy for Retinopathy of Prematurity Cooperative Group: Multicenter trial of cryotherapy for retinopathy of prematurity. Snellen visual acuity and structural outcome at 5½ years after randomization. Arch Ophthalmol 1996; 114:417.
9. Cryotherapy for Retinopathy of Prematurity Cooperative Group: Multicenter trial of cryotherapy for retinopathy of prematurity: one-year out-come. Arch ophthalmol 1990; 108:1408.
10. Laatikainen L, Mattila J, Karna J. Combined use of argon laser photocoagulation and cryotherapy in the treatment of retinopathy of prematurity. Acta Ophthalmol Scand 1995; 73(4): 333.
11. Knight-Nanan DM, O'Keefe M. Refractive outcome in eyes with retinopathy of prematurity treated with cryotherapy or diode laser: 3-year follow-up. British . J Ophthalmol 1996; 80(11): 998.

Address for Correspondence:
Dr Sadia Sethi,
Khyber Institute of Ophthalmic Medical Sciences,
Hayatabad Medical Complex,
Peshawar.