Screening of Preterm Infants for Retinopathy of Prematurity

Geetha Arcot[1], Bommana Ugandhar Reddy[2]

[1]Assistant Professor, Department of Ophthalmology, Regional Eye Hospital, Kurnool, Andhra Pradesh.
[2]Assistant Professor, Department of Ophthalmology, Regional Eye Hospital, Kurnool, Andhra Pradesh.

ABSTRACT

BACKGROUND

Retinopathy of prematurity (ROP) is a unique disease affecting the retina of premature infants.[1] The underlying pathological change is retinal neovascularization in response to retinal ischaemia.[2] ROP can regress spontaneously in early cases but lead to bilateral total retinal detachment and blindness in late stages. The first screening examination for ROP should be done after three to four weeks of birth, irrespective of gestational age.[3] As a simple rule, each premature eligible for screening should receive one examination by day 30 of life.[3]

METHODS

A prospective, randomized clinical study was conducted in our Regional Eye Hospital, South India, involving screening of 200 infants who are at risk of developing ROP. 1st screening was done three weeks after birth in low birth weight babies and gestational age <32 weeks. For babies with gestational age >32 weeks, the first screening was done four weeks after birth.

RESULTS

About 200 infants were screened in our study, out of which 34 cases (17%) developed ROP, in which 18% were in stage 1, 7% were in stage 2, 1% were in stage 3, and 5% with AP-ROP. There was male predominance. In our study, there is a significant association with low birth weight and low gestational age with the development of ROP.

CONCLUSIONS

The epidemiological profile of ROP has paralleled the changes in neonatology practices. The current burden of disease concerns the developing countries where even heavier and more mature babies are developing retinopathy of prematurity. It is essential for timely and careful retinal examination of at-risk infants by an experienced ophthalmologist to prevent the development of advanced ROP and serious sequelae, leading to complete blindness.

KEYWORDS

Retinopathy of Prematurity (ROP), Preterm, Low Birth Weight, Oxygen Supplementation, Screening

Corresponding Author:
Dr. Bommana Ugandhar Reddy,
Assistant Professor,
Department of Ophthalmology,
Regional Eye Hospital,
Kurnool- 518002, Andhra Pradesh.,
E-mail:
ugandharbommana977@gmail.com

DOI: 10.18410/jebmh/2020/137

Financial or Other Competing Interests: None.

How to Cite This Article:
Geetha A, Ugandhar Reddy B. Screening of preterm infants for retinopathy of prematurity. J. Evid. Based Med. Healthc. 2020; 7(12), 624-627. DOI: 10.18410/jebmh/2020/137

Submission 11-02-2020,
Peer Review 14-02-2020,
Acceptance 01-03-2020,
Published 23-03-2020.

BACKGROUND

Retinopathy of Prematurity (ROP) is a disease affecting the retina of premature infants.[2] Local ischemia & retinal neovascularisation is a common feature for vasoproliferative disease affecting premature infants.[3] ROP is unique in that vascular disease is found only in infants with incompletely vascularized retina.[4] The disease condition may range from mild without visual sequelae to advance disease-causing bilateral irreversible blindness.[5] All premature babies are not born with ROP. The retina is immature at the time of birth. Its postnatal development within the retinal vessels, along with the predisposing factors that lead to ROP. The sequence of events takes 4-5 weeks for the development of ROP.[6] Zone 1- a circle whose radius is twice the distance from the centre of optic disc to centre of macula, zone 2- a circle whose radius is the distance from the centre of optic disc to nasal margin of Reina (ora serrata), zone 3- the remainder of retina. This is crescent shaped zone that is largely involving the temporal retina. Vascularisation of retina is incomplete or immature prior to the development of ROP. The severity of disease is determined by staging. Stage 1- Demarcation line - Thin line separating avascular Reina anteriorly from vascularised retina posteriorly. Stage 2- Ridge which has 3 dimensions height & width and extends above the retina. Stage 3- Extra retinal fibrovascular proliferation, Neovascularisation extends in to the vitreous. Stage 4- Partial retinal detachment 4a- extra foveal, 4b- foveal, finally, Stage 5- Total retinal detachment, pre-plus disease- dilatation & tortuosity of blood vessels at posterior pole, it may or may not progress to plus disease. Plus disease - dilatation & tortuosity of blood vessels at posterior pole, associated with iris neovascularisation, poor pupillary dilatation & vitreous haze. Whereas Aggressive posterior retinopathy of prematurity (APROP), which is a rapidly progressive disease, rapidly progress to stage 5 ROP develops within 2–3 weeks.[6] If there is AP-ROP or threshold ROP, it should be intervened with a retinal laser within 72hrs.[6] In stage 4 or 5, surgical intervention is required. In India, screening is usually done four weeks after birth.[7] However, if any baby delivered before 28 weeks of gestation or birth weight less than 1200 gms, then ROP screening is done three weeks after birth.[6] ROP usually does not manifest before 2-3 weeks of postnatal date. The median age of detection of stage 1 ROP is 34 weeks.[8] Threshold ROP appears at 34-38 weeks. Normally, retinal vascularisation usually completes by 40 weeks of gestation.

In India, approximately 490,000 preterm infants are born with a gestational age of less than 32 weeks & they need proper screening to detect ROP.[9] With excellent facilities in NICU, the survival rate of premature babies has increased; an increased number of premature babies are at risk for ROP blindness.

We wanted to estimate the incidence of ROP in preterm infants presenting for ROP screening to our hospital, identify the risk factors which predispose to ROP, and assess the outcome of these cases.

METHODS

This is a prospective, randomized clinical study conducted in our hospital, among babies who came for ROP screening. Two hundred babies were screened in our Regional Eye Hospital, Kurnool. The study was conducted from May 2019 to December 2019.

Inclusion Criteria

1. Gestational age ≤ 34 weeks,
2. Birth weight less ≤ 2000 gms
3. NICU admission with known risk factors

Exclusion Criteria

1. Gestational age ≥ 38 weeks
2. Healthy baby, with no risk factors.

Methodology

Every Thursday, we screened the babies referred from the NICU ward. In the presence of a neonatologist, a detailed history was recorded including the gender, gestational age, birth weight, postnatal date, duration of stay in the hospital, oxygen therapy, any H/O sepsis, I.V. antibiotics, blood transfusion, etc. Under strict aseptic precautions, an initial ocular examination was done without dilating the pupil and anterior segment examined for congenital anomaly, corneal opacities, persistent tunica vasculosa lentis, and neovascularization of the iris. Mydriasis achieved for dilated fundus examination using diluted tropicamide and phenylephrine eye drops 2- 3 times, five minutes apart, for 15 to 20 min. A sterile infant-sized lid speculum was used to separate the lids. The fundus examination was done with an indirect ophthalmoscope using a 20D condensing lens. They are then examined for media clarity, posterior pole, i.e., optic disc, macula, retinal vessels near the disc. A scleral depressor with wire vectis is used to examine the periphery of the retina, first temporal retina followed by the nasal retina, to establish the proximity of retinal vascularisation at the ora Serrata.

The findings are noted and classified accordingly. Any new vessel formation & vascular loops & tortuosity near disc or zone 1 indicates APROP or PLUS disease. Any immaturity in the nasal periphery suggests zone 2. Complete vascularisation of nasal Retina with temporal avascularisation indicates zone 3. Follow up examination planned depending upon initial fundus finding. Further examination was done after six months to rule out refractive error & squint. Zone 1 immature retina followed up every week. Zone 2 immature retina followed up every two weeks until the retina is mature. If early signs of ROP present, then the infant is examined very week for progression or regression of the disease. After a complete examination, removal of the speculum done gently, and antibiotic eye drop instilled. For babies with gestational age >32 weeks, the first screening was done four weeks after birth. We educate the parents and interact with the mother to build rapport and collect the mother's mobile number and other family members who may be responsible for bringing the

baby for screening which helps to improve the compliance with follow up.

RESULTS

The present study was conducted at a Regional eye hospital in south India for eight months between May 2019 to December 2019. Two hundred infants admitted in NICU were eligible for the ROP screening program. Ninety infants with birth weight <1200 gms, gestational age <32 weeks (45%), 110 infants with birth weight >1500 gms, gestational age >32 weeks (55%). (Table 1).

Sl. No.	Gestational Age	Birth Weight	No. of Children	%
1.	<32 Weeks	<1200 gms	90	45%
2.	>32 Weeks	>1500 gms	110	55%

Table 1. Patients Characteristics

1st screening was done three weeks in low birth weight babies and gestational age <32 weeks. Out of 90 cases, four infants were identified with zone 1 ROP (5%). We advised them to follow up every week to rule out AP-ROP. The remaining 86 cases were identified with zone 2 immature retina, and we advised them for two weeks follow up. Out of 110 babies with birth weight >1500 gms, gestational age >32 weeks, most are in zone 2 immature retina, seen in 80 cases (72%), and we advised them for three weeks follow up. Zone 2, stage 1 disease was noticed in 20 cases (18%), and we followed them up every two weeks to assess the disease progression or regression. About 8 cases in zone 2 and stage 2 disease were seen, and we advised the mother for every week follow up, whether the condition is progressing to stage 3 or remains the same. Remaining 2 cases were identified as zone 2 and stage 3 disease which required very frequent follow-up, i.e., every week. Subsequent examination was advised every two weeks if there were no signs of ROP and every week if signs of ROP were present (Table 2).

S. No.	Postnatal Age	ROP Stage	No. of Cases	%	Follow-Up
1	<36 Weeks	Zone 1	4	5%	Every Week
		Zone 2 Immature	86	95%	Every 2 Weeks
2	>36 Weeks	Zone 2 Immature	80	72%	Every 3 Weeks
		Zone 2 Stage 1	20	18%	Every 2 Weeks
		Zone 2 Stage 2	8	7%	Every Week
		Zone 3 Stage 3	2	1%	Every Week

Table 2. Incidence of ROP with Stage According to Postnatal Age at 1st Screening

After one week, second screening was done for the babies who were at risk, i.e., zone 1 immature retina, zone 2 stage 2, and zone 2 stage 3 cases. Out of 4 cases in zone 1 immature retina, 3 cases were identified as AP-ROP, we advised them for immediate emergency laser treatment, and scheduled for every week follow up. In 1 case, the disease did not progress to AP ROP, and we scheduled the baby for frequent follow up. Out of 8 cases with Zone 2 and stage 2, 6 cases showed the signs of regressed ROP, rest 2 cases were still in stage 2 not progressed to stage 3. Zone 2 and stage 3 were seen in 2 cases, and we advised the baby for immediate laser treatment. In 166 cases (39 weeks of PND), 2nd screening was done after two weeks. Most of the cases were in zone 3A. The general condition of the babies was also good. All the babies were active, gaining good weight, Hb level was also good. We encouraged the mother to maintain good hygiene and proper care. Only in 20 cases, signs of regressed ROP were noted. (Table-3)

Postnatal Date	ROP-Stage on 1st Screening	No. of Cases	2nd Screening	Follow Up
<36 Weeks	Zone 2 Immature Retina	86	Zone 3a Mature Retina	3 Weeks
>36 Weeks	Zone 2 Immature	80	Zone 3a Mature Retina	3 Weeks
	Zone 2 Stage 1	20	Regressed ROP	2 Weeks

Table 3. ROP Stage in 2nd Screening and Follow-Up

Finally, 3rd screening was done at 41 weeks of postnatal date. The mature retina was seen in 194 cases, out of which 6 cases responded to laser treatment. No cases of stage 4, stage 5a, and b was identified in our screening.

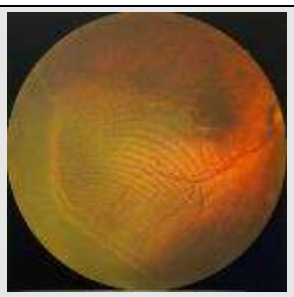

Image 1.
Zone 2 Stage 3

Image 2.
Zone 2 stage 2 ROP

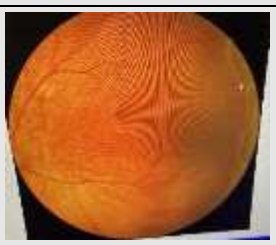

Image 3.
AP ROP with Ridge

DISCUSSION

The incidence of ROP increases with decreasing gestational age & birth weight, and risk factors like hyperoxia, sepsis, blood transfusion. ROP starts within 30 days of birth in the retina. So first screening must be completed within 30 days of birth. Most cases of (80%) ROP regress spontaneously.

Out of 200 infants, in our study, 96 (48%) were females, and 104 (52%) were males who are similar to a study done by Hakeem et al.,[10] where 84 (48.8%) were males and 88(51.2%) were females. While in Le C et al.,[11] patients with ROP showed a male predominance (59% male, 41% female), similarly in Sanandan et al.,[12] study (55% male, 45% females). In our study, 90 (45%) infants were born in gestational age <32 weeks and 110 (55%) of gestational age >32 weeks, which is similar to Hakeem et al.,[10] study, where 24 (14%) of gestational age <32 weeks and 148 (86%) of gestational age >32 weeks. In Sanandan et al.,[12] study infants with gestational age <32 weeks were 68 (76%) and gestational age >32 weeks were 21 (24%). In our study, about 90 (45%) infants had birth weight <1200 gms and 110 (55%) with birth weight >1500 gms. In Hakeem et al., study, 90 (52%) infants were of birth weight <1200 gms, and 82 (48%) were of birth weight >1500 gms. In Le C et al.,[11] study, 49% of infants were of birth weight <1500 gms, and 33% were >1500 gms. ROP incidence in this study was 34 cases(17%), in which 18% were in stage 1, 7% were in stage 2, 1% were in stage 3, and 5% with AP-ROP, which was lower than the study done by Sanandan et al.,[12] (33.70%) in which stage 1 (11.6%), stage 2 (33.3%), stage 3(48.3%), stage 4 (3.3%), stage 5 (3.3%). No cases of stage 4 and 5 identified in our study. In Le C et al.,[11] study, the incidence is 2.3%, which is lower than our study, of which 73% (stage 1), 20% (stage 2), 7% (stage 3). In Hakeem et al.,[10] study, 33 infants (19.2%) developed ROP in one or both eyes;18 (54.5%) cases stage 1, 9 (27.3%) cases stage 2, and 6 (18.2%) cases stage 3, which is similar to our study.

CONCLUSIONS

ROP is one of the preventable causes of blindness. Since ROP is asymptomatic in the early stages, it is essential for timely and careful retinal examination of at-risk infants by an experienced ophthalmologist to prevent the development of advanced ROP and serious sequelae leading to complete blindness. Screening is the first step for the identification of disease. General ophthalmologists should be trained to identify the early signs of ROP. The paediatricians/ neonatologists should be prepared to identify the neonates at a risk of developing ROP. Nurses working in NICU should be educated to understand and communicate with parents regarding the advantages and importance of the ROP screening program to prevent blindness.

REFERENCES

[1] Terry TL. Extreme prematurity and fibroblastic overgrowth of persistent vascular sheath behind each crystalline lens: I. Preliminary report. Am J Ophthalmol 1942;25(2):203-204.
[2] Owens WC, Owens EU. Retrolental fibroplasia in premature infants. Am J Ophthalmol 1949;32(1):1-21.
[3] Patz A, Hoeck LE, De La Cruz E. Studies on the effect of high oxygen administration in retrolental fibroplasia. I. Nursery observations. Am J Ophthalmol 1952;35(9):1248-1253.
[4] Patz A, Estham A, Higginbotham DH, et al. Oxygen studies in retrolental fibroplasia II. The production of microscopic changes of retrolental fibroplasia in experimental animals. Am J Ophthalmol 1953;36(11):1511-1522.
[5] Ashton N, Ward B, Serpell G. Role of oxygen in the genesis of retrolental fibroplasia: a preliminary report. Br J Ophthalmol 1953;37(9):513-520.
[6] Kinsey VE. Retrolental fibroplasia; cooperative study of retrolental fibroplasia and the use of oxygen. Arch Ophthalmol 1956;56(4):481-543.
[7] Phleps DL. Retinopathy of prematurity: an estimate of vision loss in the United states-1979. Pediatrics 1981;67(6):924-926.
[8] Gilbert C, Rahi J, Eckstein M, et al. Retinopathy of prematurity in middle-income countries. Lancet 1997;350(9070):12-14.
[9] Gilbert C. Retinopathy of prematurity--the "second lull"? Br J Ophthalmol 2001;85(9):1017-1019.
[10] Hakeem AHAA, Mohamed GB, Othman MF. Retinopathy of prematurity: a study of prevalence and risk factors. Middle East Afr J Ophthalmol 2012;19(3):289-294.
[11] Le C, Basani LB, Zurakowski D, et al. Retinopathy of prematurity: incidence, prevalence, risk factors, and outcomes at a tertiary care center in Telangana. J Clin Ophthalmol Res 2016;4(3):119-122.
[12] Amrawanshi S, Patel S. An analysis of incidence and risk factors for retinopathy of prematurity in a tertiary care center of central India. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2019,18(12):37-41.