Risk Factors and Treatment Outcome After Laser Photocoagulation for Retinopathy of Prematurity

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Abstracts

Objective: To determine the risk factors and treatment outcome of threshold and prethreshold type A ROP in pre term babies during 2002-2007

Method: Retrospective chart analysis of pre term babies in two major neonatology centers.

Results: 116 eyes of 59 babies with threshold and prethreshold type A ROP were treated with laser using indirect ophthalmoscopic delivery. Favourable outcome was seen in 97 eyes (83.6%). 7 eyes progressed to blindness in spite of treatment. 4 eyes developed Stage 4 ROP with retinal detachment and underwent scleral buckling. All of them had attached retina after 1 year. 8 eyes had developed falciform retinal fold involving the macula.

Conclusions: ROP screening is essential in the present scenario and timely intervention can prevent blindness in a substantial proportion of patients with prethreshold ROP.

Key Words: Retinopathy of prematurity (ROP), Threshold, Prethreshold, Laser photocoagulation, retinal detachment, falciform fold, scleral buckling. ETROP, ICROP.

Introduction

Retinopathy of Prematurity (ROP) is fast becoming a major cause of preventable blindness in the new born. The increase in the magnitude is due to advances in the neonatal care as well as increased awareness. In Kerala also the incidence of ROP is increasing. There are no specific data from this part of the world regarding the incidence and pattern of ROP. In the past decade there is increase in the survival of micro premature, extremely low birth weight babies. 50 % of very low birth weight (VLBW) survivors require special attention in academics and learning. 30 % of survivors among VLBW babies have some neuro sensory problems like ROP. So the economic burden of this problem can be immense. Here we present an interventional retrospective case series of ROP with special emphasis on the structural outcome after laser photocoagulation.

Patients and Methods

This was a retrospective interventional study, which was conducted between 2002-2007. It included 2 major...
neonatology centers in Cochin. All the 3000 babies born preterm with a birth weight of 1500 grams or less were screened by AM and LP in the neonatal intensive care units. If the babies were discharged, they were examined weekly in out-patient units. The first examination was done after 4 weeks of birth or at 34 weeks post conception age whichever was earlier. Pupils were dilated by using specially prepared dilating drops containing Tropicamide with 2% Phenyl Ephrine. One drop was applied every 5 minutes for 3 times and indirect ophthalmoscopy was done with the help of Alphonso speculum and topical paracaine. If the baby showed any evidence of threshold, prethreshold or progressing plus disease, MG and AG were informed. Those approaching threshold or prethreshold were given laser photocoagulation using Laser Indirect Ophthalmoscopic delivery system. Diode laser was used with a power of 200-500 mW. A gray white burn was the end point (Flow chart 1). The entire avascular retina was treated using confluent burns. Following laser the baby was reviewed after 1 week. Additional laser was given in cases not responding to laser. Babies were followed up till retina was stable. There after examination was done at 3 months, 6 months, 1 year and then every year.

Primary outcome measure was structural outcome. It was divided into favourable and unfavorable outcomes. Unfavorable outcome was defined as per ETROP guidelines as (1) posterior retinal fold involving macula. (2) Retinal detachment involving macula. (3) Fibrous tissue obscuring the view of posterior pole. If there was complete or partial retinal detachment during the follow up visit, scleral buckling was done under general anaesthesia for stage IV, A and B ROP as per ICROP classification. Encircling band (# 240) was placed at equator by making a scleral tunnel in the 4 quadrants. Band was tied in the superotemporal quadrant. Subretinal fluid drainage was not attempted unless there was a rhegmatogenous element. For drainage, diode endolaser probe was used to perforate choroid after making a scleral pocket with choroidal knuckle. The child was followed up every month for 3 months and then every 3 months. Band cutting was done after 1 year to facilitate normal growth of the eye.

Statistical analysis was done using SPSS version 11.0 (Chicago INC).

Results

A total of nearly 3000 babies were screened by AM and LP. Of these 116 eyes of 59 babies fulfilled the criteria of threshold or prethreshold ROP and were included in the study.

Laser treatment was given in (1) Zone I and Zone II stage 3 ROP with 5 contiguous or 8 cumulative clock hours involvement with plus disease. (threshold as per the cryo ROP guideline). (2) Type I ROP defined by ETROP as Zone I any stage with plus, Zone I stage 3 without plus and Zone II stage 2 or 3 with plus.

Laser photocoagulation was performed under topical anaesthesia in NICU using with 28D lens and with vectis for scleral depression and Alphonso speculum. If the end of vascularisation was seen along with optic disc in a single field it was Zone I. If there was involvement of nasal periphery it was Zone II and others were Zone III. Plus disease was defined as vascular dilatation and tortuosity in at least 2 quadrants as defined by ETROP study. Signs of regression included lessening of plus and regression of vascular fronds with fibrous tissue.

116 eyes of 59 babies received treatment for both threshold and type A prethreshold as per ETROP were treated depending on the stage at presentation. The birth weight of babies ranged from 720 gram to 1900 grams with a mean weight of 1160 grams. The minimum follow up was 3 months and a maximum follow up was 66 Months (Mean 9.1 months). Gestational age was between 25 weeks to 34 weeks.

At the last visit, favourable outcome was seen in 97 eyes (83.6%). 4 eyes developed stage 4 retinal
detachment and underwent scleral buckling surgery under general anaesthesia followed by band cutting after 1 year. They had attached retina at the last follow up. 8 cases had falciform fold at the macula. This usually results from reattached tractional retinal detachment. 7 eyes progressed to stage 5 ROP. One patient underwent lensectomy vitrectomy surgery, but failed to reattach the retina. The following chart shows the results.

**Discussion**

Despite major advances in the management of severe retinopathy of prematurity (ROP), retinal detachment and reduced visual acuity from ROP continue to be a major disability occurring in preterm infants and is one of the most common causes of severe visual impairment in childhood. The Multicenter Trial of Cryotherapy for Retinopathy of Prematurity (CRYO-ROP), the largest prospective trial of retinal ablative therapy for ROP, showed that 44.4% of eyes with a history of severe ROP that were treated with cryotherapy had a visual acuity of 20/200 or worse when children were tested at age 10 years. In children whose treated eye had a visual acuity better than 20/200, only 45.4% had a visual acuity of 20/40 or better. As a consequence, those involved in the care of infants with ROP have endeavored to find more effective approaches to treatment. One clinical trial, the Supplemental Therapeutic Oxygen for Prethreshold Retinopathy of Prematurity (STOP-ROP) study, showed no significant benefit to the use of supplemental oxygen therapy offered at a defined prethreshold point in the disease course. Another clinical trial, the Light Reduction in Retinopathy of Prematurity (LIGHT-ROP) study showed no benefit to preterm infants from a reduction in light exposure from birth to postmenstrual age 32 weeks.

In the CRYO-ROP study, peripheral retinal ablation was performed when the ocular findings indicated a risk of approximately 50% for retinal detachment. This degree of severity was termed the threshold for treatment of ROP and was defined as at least 5 contiguous or 8 cumulative sectors (clock hours) of stage 3 ROP in zone I or II in the presence of plus disease (a degree of dilation and tortuosity of the posterior retinal blood vessels meeting or exceeding that of a standard photograph). During the past several years, the timing for treatment of ROP have been questioned, with some physicians advocating earlier treatment and others recommending later initiation of treatment. A concern with earlier treatment is the expected increase in surgical intervention in eyes with ROP that would otherwise regress spontaneously. This concern has led to efforts to identify treatment selection criteria that will result in earlier treatment only in those eyes at highest risk for developing threshold ROP or an unfavorable visual or structural outcome in the absence of treatment.

In 1999, the National Eye Institute, Bethesda funded a cooperative agreement to study early treatment for ROP (Early Treatment for Retinopathy of Prematurity (ETROP) study). In the study, eyes of infants were randomized to early peripheral retinal ablation or standard (conventional) management if they developed prethreshold ROP and if RM-ROP2, a risk analysis program based on natural history data from the CRYO-ROP study, indicated a high risk of an unfavorable outcome. Prethreshold ROP was defined as zone I, any stage ROP that was less than threshold; zone II, stage 2 ROP with plus disease (Dilatation and tortuosity of posterior pole retinal vessels in at least 2 quadrants, meeting or exceeding that of a standard photograph); zone II, stage 3 ROP without plus disease; or zone II, stage 3 ROP with plus disease but fewer than 5 contiguous or 8 cumulative clock hours. The results of ETROP have set some new guidelines for the management of ROP. Treating at type A prethreshold
stage can reduce the unfavorable outcome from 15.6% in the conventional group to 9.1%. Our results are closer to the conventional group (Table: 1).

Table 1. Comparison with ETROP study result - % of unfavorable structural outcome

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<td>Cryo ROP 1 year</td>
<td>25.7 %</td>
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<tr>
<td>Cryo ROP 10 years</td>
<td>27.2 %</td>
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<tr>
<td>ETROP Conventional</td>
<td>15.6 %</td>
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<tr>
<td>ETROP Prethreshold</td>
<td>9.1 %</td>
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<td>Our Study</td>
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Conclusion

Screening and timely intervention in ROP can reduce the unfavourable outcome and blindness significantly.

References