



Outcomes of diode laser photocoagulation for zone 1 retinopathy of prematurity

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Summary

Aim: To report outcomes of diode laser photocoagulation for zone 1 retinopathy of prematurity (ROP) in a tertiary university clinic.

Material and Method: The records of 452 eyes of 257 preterm infants who were seen in retina division of Department of Ophthalmology, Cerrahpasa Faculty of Medicine between June 2007 and December 2010 and subsequently were diagnosed as zone 1 prethreshold ROP based on early treatment (The Early Treatment for Retinopathy of Prematurity Study = ETROP) criteria and treated with diode laser photocoagulation in accordance with ETROP criteria for ROP were reviewed retrospectively. Anatomic and structural success (regression of ROP and attached macula) were evaluated separately for zone 1 posterior (group A) and anterior (group B).

Results: In group A the mean birth weight was 1120.2 g (range 490-2500 g) and the mean gestational age was 28.2 weeks (range 22-35 wks). In group B, the mean birth weight was 1128.9 g (560-1930 g) and the mean gestational age was 28.4 weeks (24-34). A success rate of 98.15% and 98.65% was achieved for group A and B, respectively.

Conclusions: Zone 1 ROP group includes patients with a high risk. Diode laser photocoagulation in prethreshold stage is effective and safe for the treatment of zone 1 ROP. Updating perinatal care could provide a decrease in the incidence of ROP in premature newborns with a higher birth weight. (*Turk Arch Ped* 2012; 47: 250-253)

Key words: Diode laser, prematurity, retinopathy, zone 1

Introduction

Retinopathy of prematurity (ROP) is the most important cause of blindness and ophthalmologic disease in the neonatal period both in developing and developed countries (1,2,3). Despite developing treatment methods being able to keep infants with lower birth weights alive with a higher rate causes persistence of the problem of ROP to be a significant disease of prematurity (1).

ROP needs expertise for diagnosis and treatment. Cryotherapy for Retinopathy of Prematurity (CRYO-ROP) study defined the indication for treatment as "presence of threshold disease" (4,5) (Table 1). However, insufficient treatment outcomes dictated arrangement of both the diagnosis and treatment of ROP especially in patients with retinopathy localized in the region which is more close to the optic nerve and macula and which is called as posterior retina and defined as zone 1 (Figure 1) (6). More efficient treatment of ROP localized posteriorly has been made possible by treatment in the pre-threshold period (PTP) (Table 1) with onset of use of diode laser photocoagulation (DLP) (6,8,13,14).

We evaluated anatomic outcomes of our pre-threshold patients who were considered as high-risk patients after DLP in our study.

Material and Method

Data files of 452 eyes of 257 newborns who were registered in the Retina Division of Cerrahpasa Medical Faculty, Department of Ophthalmology, who were diagnosed as "pre-threshold zone 1 ROP" by "The Early Treatment for Retinopathy of Prematurity Study = ETROP" criteria between June 2007 and December 2010 and who underwent DLP according to ETROP criteria were examined retrospectively. The gestational age, birth weight, time of the first examination, presence of prenatal and postnatal problems and treatments, time of laser treatment, follow-up times and anatomic success data after DLP were examined.

Diagnosis and Treatment

Examination of premature babies was performed by two specialists of retina experienced in ROP (SBA, SA) under guidance

of a specialized anesthesiologist using indirect opthalmoscope and 20 or 28 D lens; the pupils were dilated using 0.25% cyclopentolate, 2.5% phenylephrine HCL and 0.5% tropicamide and crochet and ecarteur were used for examination. After examination, the patients were staged by classifying according to ETROP criteria. Zone 1 is the innermost area according to The International Classification of Retinopathy of Prematurity= ICROP classification (7) and is defined as the circle circumscribing two times the distance between the optic nerve and the center of the macula (optic nerve being the center) (Figure 1). In our study, the patients were divided into two groups as zone 1 posterior (group A) and zone 1 anterior (group B). DLP (Iris Medical Instruments Inc.Mountain View, CA, USA) was performed in zone 1 patients on the first day of diagnosis or in the first 48 hours after diagnosis by two experienced retina specialists after obtaining informed consent from the parents. Diode laser photocoagulation was applied including the whole avascularized retina with half spot intervals. This procedure was performed under the guidance of an anesthesiologist under local anesthesia.

Response to treatment

Following DLP the patients were followed up weekly by dilated fundus examination. The main expectation here was obtaining anatomic success. Treatment response was defined as good outcome (regression) or poor outcome (progression). Good outcome was divided further into a) complete regression and b) satisfactory response (partial regression).

a) Complete regression was defined as macula with clinically normal appearance, absence of vitreoretinal shrinkage, absence of vascular enlargement or absence of neovascularization.

b) Satisfactory response was defined as settled macula and focal retinal detachment accompanied by shrinkage which did not involve the macula. Poor outcome was defined as progression to stage 4b or 5.

Results

107 (51%) of the newborns with group A (zone 1 posterior) were male and 103 (49%) were female. In this group, the mean birth weight was found to be 1120 g (490-2500 g) and the mean gestational week at birth was found to be 28.2 weeks (22-35 weeks). 26 (55%) of the newborns with group B (zone 1 anterior)

were male and 21 (45%) were female. In this group, the mean birth weight was found to be 1128,9 g (560-1930) and the mean gestational age at birth was found to be 28,4 weeks (24-34 weeks). 86 patients (33%) had a history of blood transfusion, 151 patients (59%) had a history of jaundice, 128 patients (50%) had a history of sepsis, 85 patients (33%) had a history of anemia, 205 patients (80%) had a history of respiratory distress and 108 patients (42%) had a history of oxygen treatment. Treatment response following DLP in patients in group A and B is summarized in Table 2.

Discussion

Although zone 1 ROP is observed rarely, it has started to become a more significant problem, as newborns with very low birth weight are being kept alive with a higher rate (1). If zone 1 ROP is not treated, it can rapidly progress to retinal detachment (5). However, treatment outcomes of zone 1 ROP show variance in the literature (4,5,6,8,11,12,13,14). In publications until the mids of 1990s, treatment outcomes in zone 1 ROP were not very satisfactory and failure rates were observed to be at approximately 78% (4,5). One of the main reasons for this is the fact that this treatment was being performed by cryotherapy in 1990s. Posterior localization of ROP made performance of cryotherapy difficult. Another reason was the fact that “threshold disease” which was

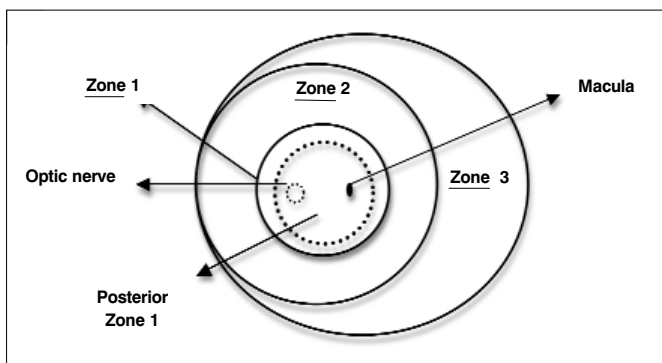


Figure 1. Schematic diagram of the left eye showing the zone borders and involvement according to CRYO-ROP classification in anatomic classification of ROP. The area including dotted lines shows posterior zone 1

Table 1. Definition of “threshold” and “pre-threshold” disease according to ETROP6 criteria	
Threshold disease	-Positive finding in zone 1 and zone 2 (enlargement and tortuosity of the posterior pole blood vessels) plus 5 contiguous clock-hours or 8 noncontiguous clock-hours stage 3 disease
Definition of pre-threshold disease	- Any stage of Zone I ROP -Zon II stage 2 ROP with plus disease -Zon II Stage 3 ROP without plus disease -Zon II, stage 3 with plus disease but fewer than five contiguous or eight cumulative clock hours

Table 2. Responses to diode laser photocoagulation of group A (zone 1 posterior) and group B (zone 1 anterior) patients

	Total (number, %)	Posterior zone 1 ROP (number,%)	Anterior zone 1 ROP (number,%)
Newborn	257 (100%)	210 (82%)	47 (18%)
Eye	452 (100%)	378 (84%)	74 (16%)
Good outcome	444 (100%)	371 (98.15%)	73 (98.65%)
Poor outcome	8 (100%)	7 (1.85%)	1 (1.35%)
Complete regression	406 (100%)	337 (89.15%)	69 (93.24%)
Partial regression	48 (100%)	34 (9%)	4 (5.41%)
Progression to stage 4B-5	8 (100%)	7 (1.85%)	1 (1.35%)

included in CRYO-ROP criteria was being used as the treatment indication in these studies. A third reason demonstrated by experimental studies is the fact that cryotherapy damages blood-retina barrier more strongly compared to DLP which might lead to additional shrinkages (15). In the randomized study performed by Hunter et al. (8), it was shown that the feasibility of DLP was better. Capone et al. (11) reported a success rate of 83.3% with DLP in patients with zone 1 threshold disease (TD) ROP, whereas Axel-Siegel et al. (12) reported a success rate of 85.5%. In both studies, it was demonstrated that DLP was more efficient in patients with ROP in the posterior area.

Although O'Keefe et al. (14) did not obtain good outcomes in patients whom they treated in the threshold disease period, they obtained much better outcomes in patients whom they treated in the prethreshold period and they concluded that zone 1 ROP patients should be treated without waiting threshold disease. Kyenthal et al. (9) also reported that the rate of failure was high in zone 1 patients and recommended that zone 1 patients should be evaluated more carefully, since findings of threshold disease showed difference compared to the classical evaluation. Vander et al. (10) reported success in 84% of 19 patients who were classified as posterior ROP including zone 1 and who were treated early. In another study, Fleming et al. (13) reported full success in patients who were treated in the pre-threshold period and none of the patients progressed to threshold disease. After this study and similar studies diagnosis and treatment of ROP was arranged in 2003 and the publication of the results of ETROP study showed that pre-threshold treatment in ROP was efficient. Soh et al. (16) found deterioration in only 6 of 46 ROP patients in the study in which they performed treatment in the pre-threshold period in accordance with ETROP criteria.

In our study, the success rate in group A patients was 98.15%. In group B, this rate was found to be 98.65%. The high success rate in both groups showed that DLP treatment was considerably efficient in these patients. The high rate of anatomic success in our study was similar to other studies in the literature. It indicated that treatment performed in the early period namely pre-threshold stage in patients with zone 1 ROP would increase the success rate markedly.

Another point which should be emphasized is the fact that the mean gestational age at birth and the mean birth weight in the

patient group in our study were higher compared to other studies. This may arise from the fact that treatment protocols including mainly oxygen treatment in premature patients have not been determined precisely or can not be applied precisely in neonatal intensive care units in Turkey which is a developing country. Conclusively, treatment of zone 1 ROP patients who constitute a special group for ROP without waiting for threshold disease decreases disease progression and the need for further surgical intervention to a considerable extent. Despite this high success rate in treatment of ROP patients the fact that high risk ROP shown by the data obtained in our study is observed in newborns with higher birth weights and advanced gestational ages in our country indicates that perinatal care and treatment of premature infants should be reviewed once again considering that decreasing development of ROP should be the main focus.

Conflict of interest: None declared.

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