

Diode Laser Treatment for Retinopathy of Prematurity – Our Experience in Bulgaria

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Abstract

Purpose: To present early structural outcomes in patients with ROP treated with indirect diode laser photocoagulation at Pediatric Eye Unit, Eye Clinic, University Hospital "Alexandrovska", Sofia, Bulgaria for a period of five years.

Patients and Methods: A 5 year retrospective study (August 2011 – December 2016) was conducted. 54 children (102 eyes) with ROP, requiring treatment were included. All children were treated with indirect diode laser photocoagulation (810 nm). Retinal status before and after treatment were documented with RetCam imaging system.

Results: 54 (102 eyes) prematurely born babies are included - 33 (61.1%) boys and 21 (38.9%) girls. The mean gestational age was 26.8 weeks (± 1.93 g.w.), and the mean birth weight - 920 g (± 274.7 g). Zone I ROP was observed in 9 (8.8%) eyes, and Zone II ROP - in 93 (91.2%) eyes. Favorable structural result was achieved in 89 (87.3%) eyes. In 13 (12.7%) eyes was observed unfavorable structural result, from which seven eyes were with retinal detachment.

Conclusion: Widespread introduction of mandatory screening programs and conducting timely and effective treatment of ROP is a key element in reducing cases of preventable childhood blindness worldwide.

Keywords: ROP, laser therapy, early structural results

I. Introduction

Retinopathy of prematurity (ROP) is a leading cause of preventable childhood blindness and severe visual impairment worldwide [9,10,11,26]. Developing countries, countries from Eastern Europe, South America, India and China are now victims of the third ROP epidemic. Thanks to the advances in neonatology and perinatal medicine in these countries, more and more premature infants born with very low and extremely low birth weight survive. This in turn leads to a significant increase in the number of children with vision – threatening ROP. ROP is the main cause of childhood blindness in Bulgaria, Eastern Europe, nevertheless our ROP screening and treatment guidelines [3]. Diode-laser photocoagulation for patients with type 1 prethreshold ROP was established as the “gold” standard in ROP treatment, nevertheless continuing search for the “ideal” method [13].

Purpose

To present the early structural outcomes in patients with ROP treated with indirect diode laser photocoagulation at Pediatric Eye Unit, Eye Clinic, University Hospital "Alexandrovska", Sofia, Bulgaria for a period of five years.

II. Patients and Methods

A retrospective study of all 54 children (102 eyes) treated for ROP in Eye Clinic, University Hospital “Alexandrovska”, Bulgaria for the period August 2011 – December 2016 was conducted. All children are born prematurely with birth weight less than 1500 grams and gestational age below 32 weeks. These are children referred for treatment by ophthalmologists from our clinic who perform screening for ROP in neonatal intensive units in the capital of Bulgaria - Sofia and children referred to our clinic by various centers in the country. Examination of the retina (before and after therapy) was performed after pupil dilation with mydriatic combination of Phenylephrine 2,5% and Cyclopentolate 0,5%, the application of local anesthesia (0,5% Proxymetacaine Hydrochloride) and eye speculum. Retinal changes were documented with RetCam imaging system (Clarity Medical systems Inc., Pleasanton, CA, USA). All children were treated with transpupillary diode laser photocoagulation (Iridex Oculight SLx Tri-Mode 810nm Diode Laser®). The indication for treatment was prethreshold type 1 ROP. Laser was applied on the avascular retina without treatment of a present ridge or epiretinal fibrovascular proliferations. Presented structural results are 2 to 6 months after the treatment.

III. Results

The retrospective survey involves 54 infants (102 eyes) - 33 (61.1%) boys and 21 (38.9%) girls. The mean gestational age at birth was 26.8 weeks (24-32 weeks, SD \pm 1.93), and the mean birth weight - 920.4 g (500-1500 g, SD \pm 274.7). With extremely low birth weight (under 1000 g) were 32 children (59.3%) and with very low birth weight (1000-1500 g) - the other 22 children (40.7%). Zone I ROP was observed in 9 (8.8%) eyes, and Zone II ROP - 93 (91.2%) eyes. Grade 3 ROP in Zone II was an indication for treatment in 80 (78.4%) eyes.

Laser therapy in both eyes was performed in 48 (88.9%) children, and in 6 (11.1%) children was conducted only in one eye. Cryotherapy in one eye and laser therapy of the other was applied in one of the children. One eye was treated with intravitreal anti-VEGF drug after laser treatment and one eye had had intravitreal anti-VEGF drug prior the laser ablation. Favorable anatomical results were achieved in 89 (87.3%) eyes. Unfavorable structural results were observed in 13 (12.7%) eyes, of which 7 (6.9%) eyes were with retinal detachment - subtotal in 5 eyes and total retinal detachment - 2 eyes.

IV. Discussion

In the early nineties of the last century the preliminary results from the first multicenter clinical trial for the treatment of ROP (The Multicenter Trial of Cryotherapy for Retinopathy of Prematurity Study (CRYO-ROP) - CRYO-ROP study were published [4, 5]. It is considered to be one of the greatest achievements in the field of pediatric ophthalmology practice [22]. This study introduced the term threshold ROP and revealed the need for mandatory implementation of cryoablation of the peripheral avascular retina at this stage due to the existing 50% risk of disease progression. Despite the observed 50% reduction in unfavorable structural and functional results in comparison with the untreated eyes, CRYO-ROP study demonstrates the need for more early treatment of ROP and the introduction of more gentle method of therapy.

Even before the launch of the Early Treatment for Retinopathy of Prematurity (ETROP), Laser ROP Study Group (1994) emphasizes the place of the laser (argon and diode) therapy in the threshold ROP not just only as an effective but also as a more sparing method compared to cryotherapy [17,18,20,21]. All this outlines the need for introducing other more effective method of treatment and initiation of therapy at an earlier stage from threshold ROP. Launched in 1999, ETROP study defines the major problems in the course of treatment only in cases of threshold ROP. It introduces the terms prethreshold ROP - type 1 and type 2 and points out diode-laser photocoagulation as the gold standard for the treatment of high-risk type 1 prethreshold ROP [7,13,14,16].

Decades the role of the ophthalmologist in the monitoring and treatment of ROP in Bulgaria was confined to the diagnosis of the retrolental fibrous mass in the affected eyes. Till the end of the last century the main treatment modality was the cryotherapy of the avascular retina in eyes with stage 3 ROP.

Now, in Bulgaria we use our Guidelines for screening and treatment of ROP, based mainly on the criteria of the ETROP study [3]. Diode laser photocoagulation of the avascular retina is the main treatment modality and criteria for treatment are treatment criteria of the ETROP study. Our study enrolling 102 eyes (54 children) treated for type 1 prethreshold ROP with diode laser photocoagulation is the largest study presented so far in Bulgaria.

Our study revealed a predominance of males (61.1%), which resembles the demographic characteristics of gender distribution according to other authors [13,15,25], revealing the issue of male gender as a possible risk factor for the progression of ROP. The mean gestational age (26.8 weeks) and mean birth weight (920.4 g) are higher than those reported by studies where ROP screening guidelines are birth weight less than 1250 g [1,6,13]. At the same time children treated by us have birth weight and gestational age lower than those reported in studies in which screening is applied in infants weighting more than 1500 g. and with gestational age of more than 32 gestational weeks [15]. This comes to prove that screening criteria adopted in Bulgaria, largely cover most of infants who would develop ROP requiring therapy.

Zone I ROP was observed in 9 (8.8%) eyes, while Zone II ROP – 93 (91.2%) eyes. The frequency of ROP in zone I in our study was significantly less than that observed in studies with children with lower gestational age [1,13] and higher than that recorded in studies with children over 1250 g [15]. These data indicate that the frequency of ROP in zone I correlates directly proportionally to the severity of preterm labor. In our study most common is ROP stage 3 in Zone II - 80 (78.4%) eyes. This is the most frequent indication for treatment regardless of the screening criteria or the degree of prematurity worldwide [1,6,8,12,13,15,19,23,24,25].

The classification of treatment outcomes either favorable or unfavorable is based on the criteria in CRYO-ROP study [4]. Favorable outcome was observed in 89 (87.3%) eyes, and unfavorable outcomes - in 13 (12.7%) eyes. This correlates with the results of other authors, but their babies are with lower gestational age and lower birth weight than infants in our group [23, 24]. Our data for unfavorable structural results are lower than those in ETROP study - 15.2% [13] and other large studies - 14.4% [19], but this easy can be explained by

the fact that our patients are more mature children who present with milder ROP. A number of authors indicate very low unfavorable results (around 5%) [6,12,15], but as poor results they present just IV and V stage of ROP or they don't have ROP patients with zone I presentation, which has a poorer prognosis in terms of future structural and functional outcomes [2,5,13].

In conclusion based both on literature review and the results of our study the diode laser photocoagulation applied on time, results in significantly reduction of the incidence of severe visual impairment and blindness in premature babies.

V. Conclusion

Advances in neonatal and perinatal medicine creates conditions for increased survivability of a growing number of children born prematurely. This determines the increasing number of children who are at risk of developing ROP and related early and late visual impairment and blindness. Widespread introduction of mandatory screening programs and conducting timely and effective treatment of ROP is a key element in reducing cases of preventable childhood blindness worldwide.

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