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SCHEIMPFLUG-BASED QUANTIFICATION OF LONG-TERM LENS CHANGES IN POST-LASER ROP CHILDREN

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Retinopathy of Prematurity (ROP) is a retinal vascular disorder affecting preterm infants, often requiring intervention with argon or diode laser therapy in type 1 ROP cases. The incidence of acquired cataract after laser photocoagulation therapy has been reported between 0.003% and 6% (1). Lens densitometry measurements are important to understand the impact of laser treatment on the lens. Slit-lamp microscopy alone, however, provides a basic assessment of the lens transparency, detecting only manifest changes. Objective documentation of the anterior eye segment in both human and animal eyes has been effectively achieved using Scheimpflug photography (2). With its integrated image analysis, Scheimpflug photography allows for the quantitative grading of lens opacifications and serves as a reliable instrument for identifying changes in lens transparency at an early stage (3). Given the potential long-term effects of prematurity, ROP, and its laser treatment on lens transparency, this study aimed to objectively assess lens changes in children post-ROP laser treatment using Scheimpflug photography in a long-term follow-up. To our knowledge, this is the first clinical research involving Scheimpflug photography as a technique for the objective evaluation of potential laser-induced lens side effects in children who have previously undergone laser treatment for type 1 ROP.

In this prospective case-control study, participants were divided into four groups:

Group 0 (Control): Full-term children without ROP (n:22), Group 1: Children with a history of prematurity but no ROP (n:24), Group 2: Children with a history of spontaneously regressed ROP (n:26), Group 3: Children with a history of type 1 ROP treated with diode laser photocoagulation (n:12).

After a comprehensive ophthalmologic examination, all subjects underwent keratometry and lens densitometry evaluation using a rotating Scheimpflug camera system (Oculus Pentacam HR).

The mean age of the children was 7.22 ± 1.80 years in Group 1, 7.00 ± 2.46 years in Group 2, 7.71 ± 0.72 years in Group 3, and 7.887 ± 0.20 years in the control group. No statistically significant differences in mean age were observed among the groups ($p > 0.05$). Similarly, keratometric values did not differ significantly among the groups. The mean lens densitometry values were 8.665 ± 0.56 in Group 1, 8.383 ± 0.39 in Group 2, 8.517 ± 0.45 in Group 3, and 7.887 ± 0.20 in the control group. Statistical analysis revealed no significant variations in lens densitometry among Groups 1, 2, and 3. However, a statistically significant difference was observed when these groups were compared to the control group ($p < 0.05$).

Prematurity has been linked to congenital cataract development, and laser therapy may theoretically induce lens protein denaturation (4). A few children in the Early Treatment for Retinopathy of Prematurity (ETROP) study developed cataracts after undergoing diode laser therapy for ROP, with the condition appearing by 6 months' corrected age. They suggest that even if no complications occur during or immediately after laser treatment, the potential for cataract formation persists, so careful

monitoring is essential until at least 6 months of corrected age and possibly longer (5). While prematurity has been associated with congenital cataracts, our study found no significant increase in lens density post-laser treatment, suggesting its long-term safety. Yet, premature children exhibited increased lens density compared to controls, indicating potential independent risk factors. Our findings also suggest that laser treatment for ROP does not induce significant long-term lens opacity. However, larger, prospective studies are warranted to further investigate these observations and explore underlying mechanisms. Clinicians should remain vigilant regarding lens health in premature children post-ROP treatment, given their potential heightened risk for complications.

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