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Biophotonics

Laser applications in retinopathy as invasive therapy and possibility of pre and post diagnostics by appropriate image processing

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Retinopathy of Prematurity (ROP) is a leading cause of blindness in children. The ROP is a disease that occurs in premature infants and affects the blood vessels of the developing retina. The unique feature of ROP relates to its occurrence only in premature infants with immature and incompletely vascularized retina. We reduce the blindness from ROP by appropriate screening and effective diode laser treatment (diode red 810nm). Ocular fundus photos are performed as a part of ROP screening. During screening examination, the RetCam3, equipped with 130° lens, is used to obtain the color images of both eyes. In all cases of active posterior ROP the laser treatment is performed. In those infants the fundus images are taken in sessions of laser treatment and it is repeated one or two weeks later. The goal of each imaging session is to obtain clear and focused images of all parts of the ocular fundus. The images are stored on the RetCam3computer hard drive.

This paper attempts to compare certain methods of quantifying results of several stages of the pathological eye conditions in clinical practice based on RetCam image records. The first image processing is related to the application of color analysis by the program Matcad. It is scrutinized if the increased or decreased presence of certain colors in an image of a full eye or specific parts of the eye indicates the degree/severity of the disease (pathological state). Another approach is the implementation of the program Image J. The third quantification belongs to fractional analysis where several approaches are executed related to the application of different filtrations. Herein it is addressed the analysis of concrete examples and analysis of different utility levels of processing technique. In particular, some issues of interaction of the three laser types with eye tissue in various operating modes (ex. Q-switched lasers and others) are particularly discussed.