



Bern University
of Applied Sciences

MERIDIAN+

HEIDELBERG
ENGINEERING

SELECTIVE RETINA THERAPY WITH A NOVEL LASER

Problem – Challenge

Laser photocoagulation of the retina has been performed for the treatment of diseased eyes for more than 40 years. The procedure enables coagulation and denaturation of retinal layers by the deposition of heat in the tissue. However, for treatment of retinal pigment epithelium (RPE) linked pathologies, e.g. diabetic retinopathy, the excessive adjacent tissue damage – and especially the denaturation of the photoreceptor layer – is considered to be disproportionate. An alternative treatment approach is selective retina therapy (SRT). SRT specifically targets RPE cells while sparing the surrounding tissue by using microsecond laser pulses, preventing unwanted side effects and scotoma. The selective treatment effects on the RPE are ophthalmoscopically invisible which makes the procedure difficult for the physician. In addition, lasers which optimally support SRT parameters are not readily available on the market. Therefore, a device for proper spatial spot application, documentation and laser dosing control is required, as well as a suitable laser.

Solution

This was realized, by the Institute for Human Centered Engineering HuCE of the Bern University of Applied Sciences BFH, in a device called SPECTRALIS CENTAURUS which is a modified conventional optical coherence tomography (OCT) platform (Heidelberg Engineering, Heidelberg, DE). This system allows the treating physician to control SRT with OCT. Furthermore, a novel SRT laser has been realized together with the industrial partner Meridian AG (Thun, CH).

The SPECTRALIS CENTAURUS and the novel laser allow to perform fundamental and applied research. In experiments on ex-vivo pig eyes and RPE explants the OCT imaging function and the laser are used to investigate and improve SRT. Results show, that the combination of OCT and SRT in one system can be used for automated dose-control. Furthermore, the novel laser shows promising results by targeting the RPE with pulse durations from 2 μ s to 20 μ s. In general, results show that OCT as real-time dosimetry has the potential to establish SRT as standard therapy for retinal pathologies.

Currently available SRT lasers deliver pulses with a duration of 1.7 μ s. The newly developed laser has adjustment options that make it possible to adapt the treatment to the highly individual retina absorption properties of patients. Thereby, the modified laser can still be used for its original purpose, which makes it suitable to treat the whole range from SRT up to laser photocoagulation. This opens market opportunities for Meridian because the laser is unique.



1
SPECTRALIS CENTAURUS
(upgraded Spectralis OCT platform,
Heidelberg Engineering, Heidelberg, DE)

2
Novel SRT laser from Meridian AG

3
Close-up view of a porcine RPE explant showing
a rectangular SRT lesion