Editorial

Holger Lubatschowski

Lasers in ophthalmology

https://doi.org/10.1515/aot-2021-0055

The use of light for therapy and diagnosis of the eye is self-evident. Even before the invention of the laser in 1960, for example, the legendary ophthalmologist Gerd Meyer-Schwickerath built a solar collector on the roof of his clinic in 1947 to make burns in the retina by means of photocoagulation in order to seal holes and prevent retinal detachments. Cinema projectors, halogen lights and finally laser light followed as light sources to become independent of the weather and to increase precision.

Even today, the diagnostic and therapeutic use of lasers in ophthalmology continues to be a pioneer for the entire field of medicine. Even more: Once a new measurement or therapy principle has been discovered and successfully applied, its use on the eye also influences an entire branch of industry, such as the manufacture of laser beam sources. This was the case with excimer lasers about 20 years ago and today's femto lasers, which became cheaper and more stable in operation due to the high demand.

This issue makes it clear that the innovative power in the field of laser application in ophthalmology is unbroken. Laser application in refractive surgery has the greatest appeal in science and public interest. This is also reflected by the contributions in this issue.

The article by Thomas Asshauer provides a wonderful introduction to the field of femtosecond lasers for eye surgery applications. He explains the interaction mechanisms of ultrashort pulses with tissue in an excellent didactic way. In addition, he describes the various applications of the laser in the anterior segment of the eye.

An example of how knowledge in laser processing of ocular tissue can also positively stimulate the field of industrial material processing (and certainly vice versa) is shown in the work of Sam Mosquera, who investigates the effect of laser parameters on residual smoothness of the processed corneal tissue.

The second paper by Sam Mosquera et al. (A Simple Cornea Deformation Model) is also indirectly about the application of the femto laser in refractive surgery. If tissue is removed from the cornea of the eye to change its superficial curvature and thus the refractive power, the biomechanics of the cornea are also changed. It is important to understand this influence and to include it in one's geometry calculations before applying the laser for surgery.

Knowledge of corneal biomechanics is of great importance not only in refractive surgery. Also when it comes to diagnosis for early detection and progression in corneal diseases or determination of intraocular pressure (e.g. in glaucoma). Here, too, a precise knowledge of the biomechanical properties of the cornea is essential. The article by Patryk Mlyniuk shows how this mechanical property can be measured quasi "contact-free".

The third contribution by Sam Mosquera points a little further into the future. He gives an overview of the pioneering work of Wayne Knox's group on Laser Induced Refractive Index Change and suggests how this effect can be optimized and used beneficially. This would actually be the first refractive surgery application without removing tissue. A noninvasive procedure indeed.

The article by Mario Mordmüller on temperature controlled retinal laser treatment closes the historical loop and goes back to the pioneering work of Meyer-Schwickerath. The authors impressively show how incredibly precise the process of retinal coagulation can be kept under control today and how diseases such as diabetic retinopathy and macular edema, or ischemia due to vein occlusion may be treated.

Look forward to an impressive journey through the fields of aepplication of the laser in ophthalmology!

Bionote

Holger Lubatschowski has studied physics at the University of Bonn. After his PhD he moved to Hanover and became Head of Medical Laser Department at the Laser Centre Hanover (LZH). In 2001 he completed his postdoctoral lecture qualification for physics at the physics faculty of the Leibniz University of Hanover. Holger was heading the department of 'Biomedical Optics' at the LZH until 2010. Today he is CEO of ROWIAK GmbH. ROWIAK develops innovative procedures and devices for eye surgery and ophthalmic diagnosis.

Prof. Holger Lubatschowski, PhD, ROWIAK GmbH, Hanover, Germany, E-mail: H.Lubatschowski@rowiak.de