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Laudation delivered at the ceremony of presenting second Tadeusz Krwawicz Gold Medal to Professor Franz Frankhauser in Lublin, on 29 March 1996

Laudacja wygłoszona podczas drugiej uroczystości wręczenia Złotego Medalu im. Tadeusza Krwawicza profesorowi Franzowi Frankhauserowi w Lublinie dnia 29 marca 1996 roku

Gottfried O.H. Naumann

Rector Magnificus, Spectabilis, Professor Szwarc-Krwawicz, Docent Krwawicz, Members of the Council of the Tadeusz Krwawicz Foundation, Professor Pecold, Professor Zagórski, and, of course, the main person in this room, Professor Frankhauser – for whom we have all gathered here – Dear Franz, Dear Sylvia, Ladies and Gentelmen, Dear colleagues.

It is really nice to be back in Lublin and it is my great pleasure to be invited to give this laudation to, I can say, my senior friend, Professor Franz Frankhauser. It is a privilege and I appreciate the honour, but I realize the difficulties to speak about one of the most outstanding ophthalmologists of this century – Franz – I am saying this from the bottom of my heart.

As I am aware of the complexity of my task I am a little bit confused how to arrange my presentation; I will try to make an experiment – I know that you are fond of experiments. I will try to follow the strict rules of preparation of publications in biomedical journals – the so-called Vancouver style. It will make my task easier and will give to it some order. At first I will start with the **background**, then I will talk about the **methods**, it will be followed by **results** and observations and finally I will come to practical **conclusions**.

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Background

Some people in medicine think that ophthalmology is a small discipline. That this is obviously wrong is known to all ophthalmologists. Five percent of the children have a squint, 8% of the gentlemen in this room have some form of colour blindness, 3% are diabetics and if they are not treated they will be blind, 5% are glaucoma subjects or suspects – there is no way to follow up glaucoma properly without the automated perimetry that Professor Frankhauser developed. The extracapsular cataract extraction makes miracles that are accepted as a matter of fact, but it would be very difficult to realize without another very important invention of Professor Frankhauser, i.e. photodisruptive, Q-switched YAG laser. We would have patients with secondary cataract and we would not know how to treat it without old-fashioned invasive, mechanical methods. A few things have been used for general medicine, like the opthalmoscope of von Helmholz and Graefe is now used by internists and surgeons as an endoscope. Light and laser photocoagulation and cryotherapy started in ophthalmology and spread to general medicine. We have not only minimal invasive surgery but non-invasive surgery thanks to Professor Frankhauser.

Methods

The methods we have for this laudation are very low tech. Looking at literature to 1965, I found a study of yours, differentiating malignant melanoma of the choroid from benign naevi.

Then was of course the Woundhealing Symposium in Tübingen.

Later we got acquainted with your machines and I have never stopped to marvel at the real miracles that your Q-switched YAG laser works on each patient who has secondary cataract or pupillary block angle closure glaucoma. We can just make a hole in the iris or posterior capsule without opening the eye. We are now used to it but I still consider it as something very special.

Observations

It is the most important but not an easy task. We are dealing here with a pioneer who has made a real breakthrough in ophthalmology by a unique combination of ophthalmology, physics and mathematics. You have managed to make other people enthusiastic to cooperate with you. To mention a few names they are: P. Cibis, J. Enoch, Th. Schmidt, P. Niesel, B. Gloor, H. Bebié, J. Marshall, F. Koerner, E. van den Zypen, J. Flammer.

And to get all those people into action needs some convincing type of genius. I will not get you involved with all the details of his curriculum vitae but I should say that apart from the support of your colleagues you have had an astounding capacity for work, as Balder Gloor said at another occasion, working not only 24 hours a day but also every night. I think this is also due to the support you had from your first late wife Verena and of course from Sylvia who is supporting your efforts all the time. You were very closely associated with the University of Bern, Hans Goldmann has been your early inspiration. You have also tried distant countries – India, where you were exposed to the ophthalmology in the very difficult circumstances. Then you switched to the center of the USA to Paul Cibis and Bernard Becker in St. Louis and since 1962 you have been professor at the University of Bern. You have turned down offers to be chairman of the department being wise enough not to be loaded with additional obligations of fighting with administration. To summarise your basic research: you have started with visual physiology very early, in 1958 and I mentioned my very first contact with explanation of visual defects in choroidal nevi. You have tried to develop and succeded with developing devices like giving a calculator a voice and expression which are very difficult to achieve.

Then you have done extensive work on the light and laser coagulation and their interactions with the tissue.

And then, of course, your development of Octopus 201 and automated perimetry in 1974. Many have tried to get the perimetry into the fashion that one can standardize the findings, which one can compare to get a reasonable follow-up.

Then away from all the mechanical devices with knives and needles and so on you worked with Q-switched YAG laser Microruptor and its disruptive effect, which sounds like very destructive, but it is not. Young people now do not realise that something that used to be a major procedure in an operating room, today is a method in a range of nanoseconds. One cannot stop praising it.

You have used laser scalpels in laser sclerostomy which is a sign that you keep working and keep developing.

I will not go into the details of your publications – you have more than 300 publications, but what is nice to know is that you did get recognition. I think it is worthwhile to go through the awards.

Even before the automated perimetry you have received the Albrecht – von Graefe – Award for your basic work in physiology. Then you got a Honorary Doctorat of the University of Basel, Alfred – Vogt – Preis, Marcel Benoist Award, Alcon Research Institute Award, von Helmholz Medaille, George Weinstein Award, Wessely – Medaille, Theodor – Axenfeld – Preis and finally Albrecht von Graefe Medaille, which is presented every 10 years by the German Ophthalmological Society (Deutsche Ophthalmologische Gesellschaft).

Conclusion

I have tried to summarize my observations and now I will come to a short practical conclusion. I believe that the Tadeusz Krwawicz Foundation made a very good choice of the recepient of second Tadeusz Krwawicz Gold Medal. I have attempted to sketch a towering personality in ophthalmology not only of our time, which will have lasting effects on our field.

Countless patients will benefit and do benefit from his developments. He will remain a shining example not only of Swiss but European ophthalmology.

Wykład okolicznościowy

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Mechanisms related to photic hemostasis. Modelling the Thrombogenic Action of Nd:YAG Laser Light on the Vessels of the Human Eye

Mechanizmy związane z hemostazą świetlną.
Modelowanie trombogennego działania światła laseru Nd:YAG na naczynie oka

Franz Frankhauser

Key words: Laser, Nd:YAG Laser, vascular structures, irradiation, absorption, thrombogenesis, hemostasis

Słowa kluczowe: laser, laser Nd:YAG, układy naczyniowe, promieniowanie, absorpcja, trombogeneza, hemostaza

Introduction

The mechanism of hemostasis induced by laser irradiation remains an enigma. This paper is intended as a contribution towards its understanding.

With few exceptions, the hemostatic efficiency of a specific wavelength of light has been interpreted in terms of absorption of light energy by hemoglobin (Hb) and Oxyhemoglobin (HbO). While the effects of absorption may be considered an important starting point, a number of other effects must be considered. Otherwise, wrong conclusions are inevitable and one cannot attempt to explain, for instance, why krypton red or Nd:YAG laser radiation have good hemostatic properties.

We shall consider the following points in relation to photic thermothrombosis:

1. Effects related to the absorption of radiated energy by hemoglobin.
2. The basic quantities responsible for the increase of temperature within vessels irradiated by the laser beam.
3. The influence of hemodynamic factors upon intravasal temperature increase.
4. The effects of temperature increase upon the optical properties of blood.
5. Microscopic *in vitro* and *in vivo* studies of thrombogenesis induced by laser irradiation.

The hemostatic and thrombogenic effects of Nd:YAG laser light for the treatment of vascular problems in ophthalmology, contrary to what some people believe, are considerable. This has been shown with the effects of Nd:YAG laser light upon mesenteric, conjunctival, ciliary body or the retinal and choroidal vessels (8, 9, 21-27). This is an apparent contradiction to what might be expected from the absorption spectra of Hb and HbO. Other effects therefore need to be considered.

The effects of absorption of radiated energy by hemoglobin and melanin

The melanin contained in the pigmented epithelium (PE) and the choroidal melanophores absorbs laser radiation much more strongly than either Hb or HbO, when comparing equal thicknesses of absorbing layers (5). (Obviously, in comparing absorption, equal thickness of different light absorbing materials must be compared.)

It has been shown that, at wavelenghts shorter than about 625 nm and for a subretinal vascular

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