Prof. dr hab. Zofia Drzazga
University of Silesia
Institute of Physics
Departament of Medical Physics

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Assessment about the doctoral dissertation
***"The impact of long-term wear of modern daily disposable contact lenses on ocular physiology"* by Maryam Mousavi**

Informatics (IT) revolution has caused that people spend a lot of time at the computer, smartphone, routinely use cell phones and more often have to use vision correction. An evolution in soft contact lens technology and their materials is contributing to replace classical glasses by contact lenses. Wearing contact lenses is becoming more and more common in contemporary society, especially among the younger generation with visual impairment. However, there are a number of studies showing an adverse effect of their use on ocular physiology, especially the tear film physiology. Discomfort and the "dry eye" effect are usually found in people prescribing contact lenses. Therefore, the doctoral thesis in the analysis of the impact of long-term wear of modern daily disposable contact lenses on ocular physiology and the attempt to propose new guidelines for optimal fitting of contact lenses, I consider it to be the most intentional.

It is worth noting that the doctoral dissertation was carried out in the framework of the Polish-Spanish cooperation between the University of Valencia and the Wrocław University of Technology as part of the European Union's Horizon 2020 research project in accordance the EDEN program (European Dry Eye Network).

Maryam Mousavi as a qualified optometrist had an access in the field of contact lens wear and its side effect on ocular surface quality. For this reason she probably chose this area of research in order better to understand the influence of material of the modern contact lenses on anterior eye disease. A dynamic equilibrium between the ocular surface, tear films, eyelids and lacrimal glands to maintain homeostasis and its disturbance were the leading theme of chapter I of doctoral thesis. Her study focused on the tear film - the major determinant of ocular surface health. The contents included in the introduction prove a good understanding of the ocular physiology as well as diagnostic methods used in assessing the quality of the surface of the eye and its diseases in the context of wearing contact lenses. A bit I am lacking

in this introduction part of deeper description of contact lenses, their structure and the specific geometric property, particularly of the ones used in experiment.

The objectives of thesis are clearly defined at the end of chapter I. The main aim was to study the impact of long-term wear of daily disposable contact lenses of type SiHy (silicone hydrogel) and Hy (hydrogel) on ocular physiology.

The schedule of study protocol presented in Table1 was well prepared after one year getting acquainted with the literature of the topic and discussions. A relatively large group (60 persons, including 19 men and 41 women) of young people (25.5 + - 4.3 years), participated in the experiment lasting 12 months. Experimental included a qualifying visit (Baseline), contact lens fitting visit on the second day , a control visit at two weeks and the follow-up visits at three, six and twelve months. The final Control Visit after completing the 12-month course of contact lens wear was performed for 34 subjects fitted with SiHy and 12 with Hy contact lenses. According to the research program, symptoms of ocular surface disease, dry eye were determined using OSDI and CLDEQ-8 questionnaires as well meniscus tear height, tear osmolarity, tear film surface quality (TFSQ) were assessed. In addition non-invasive methods were used with keratograph 5M to assess break-up time and ocular redness. The tests were carried out in a laboratory with temperature and humidity monitored in each visit. It is worth to draw attention to the number and variety of tests performed during this longitudinal experiment. Detail recording sheets were included in 9 Appendices.

The results obtained were statistically analysed using two-factor ANOVA for each variable. The comparison between base line and the final control visit measurements with a paired Student's T-test was performed. The results were analyzed due to: the lens type in each diagnostic visit (occasion), the occasions regardless of the lens type and the differences between the lenses on one or more occasions. Reliably made statistical estimation is a strong point of this doctoral dissertation.

In my opinion used methodology was suitable to proposed objectives. However the questions arise what decided the choice of lenses used in the experiment and whether the group was homogeneous in terms of eye defects.

A detailed analysis of the results of the research was included in Chapter III on 23 figures and in 6 tables. The analysis were performed for both right and left eye, but it was no found statistical difference between them. Summary of statistical analysis for each variable and comparison of base line with final control measurements were collected in Table 6.

First, the review of the results indicates no significant differences between the averaged effects of wearing modern Hy and SiHy contact lenses although the results show a large spread of data. However some statistically significant differences in the examined physiological parameters of the ocular surface caused by the wearing of contact lenses were obtained as a function of the occasions as well in comparison of base line and final measurements. A mild or normal level of discomfort and dry eye effects were reported by all participants in the experiment, both those wearing SiHy and Hy lenses. Even a slight drop in the OSDI score was observed when compared base line with the control visit at two weeks or with the final control visit. The obtained parameters practically closing to the values observed in healthy subjects suggest that the used contact lenses were compatible with the eye and did not deepen the dry eye effect, which may indicate good quality lens material and its good fit to the user. The corneal staining also revealed an improvement of ocular surface health at the final Control Visit unlike conjunctival staining. There was no statistical significant difference in tear film quality between contact lens wear and non-contact lens wear in this study. A reduction in TFSQ was found for contact lens wear in comparison with healthy due to evaporation rate and tear film thinning.

The quite new finding is the statistically essential decrease in tear osmalarity which is contrary to most current studies. According to a PhD student "reduction in osmolarity may be due to the timing of the measurements done or it may be due to corneal desensitization after prolonged contact lens wear – as the osmolarity values go even smaller during follow up visits". In my opinion this problem needs clear explanation.

The work has its limitations, but the author is aware of this. She pointed out the non-randomization of the lenses in the group in order to obtain a similar number of SiHy and Hy lenses, the lack of control of ruthless temperature and humidity in the laboratory, the provision of free lenses, which could affect the subjective results of OSDI and CLDEO-8 questionnaires. However she was able to reasonably justify them. For example, the temperature in the laboratory changed within 12 months, but the character of these changes was the same for both types of lenses, so it did not affect the comparison of results against the type of the lens. The delivery of free lenses could lead to an increase in subjective answers about the comfort of the lenses worn, but also mobilized to systematically participate in the research project.

Generally, I highly appreciate doctoral thesis both in content and form. Mentioned above remarks and comments do not affect its scientific value. The main finding from work is

that the use of modern daily disposable lenses is not harmful to ocular surface physiology and may even improve some ocular parameters as a reduction in osmolarity or cornel staining scores. The importance of continuous monitoring of the wearing of contact lenses by ocular specialists is underlined. However, it would be advisable to approve the results for a larger group of Cl users with different types of contact lenses, paying special attention to these parameters, such as osmolarity behavior, which is very interesting but contrary to the majority of current studies.

The scientific achievements resulting from this thesis were partly published in thematic peer-reviewed journals (3 articles) and international conference proceedings (8 presentations). One paper is in second round review in PLOS ONE. PhD student is the first author of 2 articles and 3 conference contributions. In my opinion the candidate – Maryam Mousavi meets very well the statutory requirements for the degree of Ph.D.

W konkluzji, mogę stwierdzić, ze Kandydatka w pełni spełnia ustawowe wymogi stawiane osobom ubiegającym się o tytuł naukowy doktora zgodnie z ustawą z dnia 14.03.2003r. o stopniach naukowych i tytule naukowym oraz o stopniach i tytule w zakresie sztuki ((Dz. U. Nr 65, poz. 595, z późniejszymi zmianami, Dz.U.2016.0882 ze zm. w Dz. U. z 2016 r. poz.1311)) oraz z rozporządzeniem Ministra Nauki i Szkolnictwa Wyższego z dnia 30 października 2015 r. w sprawie szczegółowego trybu i warunków przeprowadzania czynności w przewodach doktorskim, w postępowaniu habilitacyjnym oraz w postępowaniu o nadanie tytułu profesora. Wnoszę o dopuszczenie mgr Maryam Mousavi do dalszych etapów przewodu doktorskiego.

Zofia Drung