

Contact lenses are a popular solution for visual correction. Nowadays more than 70 million people worldwide are contact lens users. Soft contact lenses are the most used contacts. But there exists much more kinds of contact lenses. Scleral contact lenses are rigid and larger in diameter than the soft lenses. They are not as popular as the soft ones because traditionally they have been used for therapeutic purposes, as the last chance for visual correction when the rest of methods failed. Recently scleral contact lenses have gained popularity among the users. Even though they might seem more uncomfortable than the soft ones (they are larger and rigid so their manipulation requires more experience) the rigid material they are made of allows a higher quantity of oxygen pass through the lens to the eye, which means that they might be a healthier solution than the popular soft lenses even for healthy normal eyes. However, there are no studies about the effect that wearing these lenses may have on the ocular surface. This is what this research project is about. Fifteen different subjects will wear soft contact lenses and rigid mini-scleral contact lenses during a period of 1 day and later 1 week. We will measure the shape in detailed (topography) of their anterior eye surface before and after wearing the lens and we will compare the results to check is there is any difference in the topography of the eye because of the contact lens wear.

To check if there is any change in the shape of the ocular surface we will use three different techniques. First, slit lamp examination, which is the most common tool for observing with detail the anterior part of the eye and check the eye condition, however does not provide information about the topography. Second, Optical Coherence Tomography (OCT) which is a fundamental clinical and research tool for imaging of the eye because it is a non-invasive, non-contact, high-resolution technique. Third, we will use Eye Surface Profiler (ESP), which is a new device in the market unique in its species because it is able to acquire 3D data from the whole anterior surface of the eye, including the cornea and the sclera (the white of the eye) while the conventional topographers are only able to measure the changes in the cornea. Department of Biomedical Engineering at Wrocław University of Science and Technology is one of the few research centers in the world with simultaneous access to OCT and ESP, letting us in a privilege position for the study and understanding of the changes in anterior eye topography as a consequence of the usage of different kind of contact lenses.

It is possible to separate the committed tasks in this project into two groups: Data acquisition and data analysis. For data acquisition tasks we will measure how the topography of the subject's changes before and after wearing mini-scleral contact lenses in a first phase and soft contact lenses made with different materials in a second phase. For data analysis we will need to develop different kind of algorithms and use mathematical and computer simulations to understand and interpret the data acquired. Data acquisition and data analysis tasks can be developed at the time resulting in an efficient time-management proposal.

The outcome of this research work is to understand how the anterior surface of the eye changes after wearing contact lenses, which might compromise ocular's health.