Summary

Thesis title:

"Measurement and analysis of the air-puff induced corneal deformation dynamics”

The aim of the doctoral thesis is to investigate the dynamics of corneal deformation caused by a blast of air used during intraocular pressure measurement. The detailed goals are: determination of corneal dynamics parameters which present high repeatability in subsequent measurements of individual eyes; determination of the relationship between corneal dynamics parameters and measured intraocular pressure; an attempt to determine a relationship between intraocular pressure measurement and blood pulsation signal.

Measurements of corneal deformation dynamics were performed using an air-puff tonometer Corvis ST. During a measurement of intraocular pressure, this device registers a sequence of images which presents a deformation of the horizontal corneal profile in response to the air blast. The image sequences recorded during measurements were analyzed for dynamic changes of curvature distributions along the corneal profiles, indentations and displacements of the corneal profiles, displacements and rotations of the entire eyeballs, and vibrations of the corneal profiles. In the dissertation some new parameters describing these phenomena have been proposed. The values of these parameters, their repeatability and correlations with other parameters, e.g. with intraocular pressure have been determined. The thesis also presents a method of measurement and analysis of synchronously recorded signals of the cardiovascular system and intraocular pressure pulsation.

The methods of analysis and the results presented in this dissertation may lead to better understanding of the biomechanical properties of the eye and may be used in the future for development of new, non-invasive methods for diagnosing the anterior segment of the eye.

Keywords: biomechanics of the eye, corneal dynamics, corneal curvature, corneal vibrations, intraocular pressure, Corvis ST