

A Measurement Device for Rotational Stiffness of the Eye

Thijs R. de Graaf, Sander Schutte, Huib J. Simonsz, Arthur G. Erdman, Frans C. T. van der Helm, and Just L. Herder

Objective: A measurement of rotational stiffness of the human eye is necessary, without exerting forces to the eye. **Background:** Strabismus is a disorder in which the visual axes of the eyes are misaligned. In strabismus surgery, the muscles that drive the eye are altered to compensate for the deviating angle of the eye. Unfortunately, between 20% and 50% of these operations need resurgery. A sensitivity analysis has suggested that one cause for an erroneous outcome of surgery is due to interindividual differences in rotational stiffness induced by tissue surrounding the eye.

Methods and Results: A measurement device comprising a moment transferring linkage mechanism was developed. A moment is transferred to the eye without imposing a stationary point of rotation. The mechanism is attached to the eye and has three degrees of freedom. The eye is free to rotate under the applied moment. The applied moment and the resulting angle are measured to calculate the rotational stiffness of the eye. Parasitic forces are minimized by keeping friction, inertia and stiffness in the mechanism to a minimum. In addition, the three degrees of freedom of the mechanism are statically balanced. **Conclusion:** Preliminary tests have shown the feasibility of the measurement in a sterile environment in people that are in horizontal position.