Dynamics of the vitreous humour induced by eye rotations: implications for retinal detachment and intra-vitreal drug delivery

Rodolfo Repetto

Abstract:

The vitreous cavity constitutes most of the eye volume and is filled with the vitreous humour. In young subjects the vitreous has the consistency of a homogeneous viscoelastic gel. With advancing age, however, a progressive collapse of the collagenous framework typically occurs, leading to the liquefaction of the vitreous body, a process called synchisys. Eye rotations produce significant flow in the vitreous, which is clinically relevant since it affects the stress pattern on the retina and drug transport processes within the vitreous cavity.

The dynamics of the vitreous humour secondary to eye rotations are studied theoretically. Various models of increasing complexity will be presented during the seminar, in which different physical effects will be progressively accounted for. How the problem can be suitably simplified so as to obtain analytical or semi-analytical solutions, yet retaining the most significant aspects of the physics involved, will be discussed. Theoretical results will be compared with experimental data, showing good agreement.

Finally, the clinical significance of the research and its future perspectives will be discussed.