Abstract 44

DO DAILY ACTIVITIES IMPACT GAS TAMPONADE – RETINA CONTACT AFTER PARS PLANA VITRECTOMY? AN EXPERIMENTAL AND COMPUTATIONAL FLUID DYNAMICS STUDY

Oral

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Purpose:

To measure the amount of retinal surface wet by aqueous as a result of fluid sloshing consequent to eye and head acceleration due to daily activities and as a function of gas fill, after pars plana vitrectomy

Methods:

Computational fluid dynamics was used to model the vitreous chamber and acceleration imposed to the vitreous chamber content by daily activities such as the eye saccade, standing up from sitting, turning head and braking car. Eye model previously validated simulated gas fill between 0% and 100%. The amount of retinal surface steadily in contact with air, gas and alternatively in contact with gas and aqueous as a result of fluid sloshing was determined at rest and for each considered activity.

Results:

Activities significantly impacted the retinal surface affected by sloshing: standing up determined the largest area of wettable retina, followed by car braking, rotating the head and ocular saccade. The extension of retina affected by aqueous sloshing was not significantly affected by gas fill. Standing up exposes the largest retinal surface to aqueous contact. Regardless of gas fill percentage, all activities determined a significant increase of wet retina. The mean percentage of “wettable” retina during all activities was 13%-16%. Car braking induced a significantly higher shear stress that any other activity ($p<0.05$). Pulse was significantly different among activities ($p<0.001$).

Conclusions:

Regardless of patients' compliance, daily activities increase significantly by an 1average 15% the amount of retina in contact with aqueous. Shear stress induced by fluid sloshing during such activities exceeds retinal adhesion force and may explain fluid leakage into the subretinal space, retinal detachment and retinal shifting.