Saleha Al-atawi, Optom open access 2018, Volume 3
DOI: 10.4172/2476-2075-C1-008

Internal lens structure changes during simulated accommodation

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Aim: Since the internal structural changes that occur during the lens accommodation process are not fully understood, in this study we aimed to analyze lens fibre widths during simulated accommodation.

Methods: Porcine eyes (n=11) were dissected and attached to a lens stretcher. 3D image stacks (between 120 μm to 240/270 μm depth) of the anterior and posterior surfaces of five lenses, while immersed in artificial aqueous humour solution, were acquired using confocal microscopy in the un-stretched configuration and then the stretched configuration. Three lenses remained in the un-stretched configuration and three lenses were subjected to stretching. All six lenses were fixed with 4% paraformaldehyde, snap frozen and then serially cut into cryosections of 25 μm in thickness. 1 mm interval sections were incubated in PBS- wheat germ agglutinin-Hoechst 33342 solution. Lens fibre widths were measured following acquisition of fluorescent images of each lens at different depths.

Result: From the confocal images, there was a significant difference between unstretched and stretched configurations in both anterior (mean lens fibre width: 5.1±0.589 μm versus 5.625±0.345 μm, $p<0.0001$) and posterior surfaces (5.55±0.16 μm versus 5.67±0.25 μm, $p<0.0001$). In fluorescent images, lens fibre widths were unchanged between unstretched and stretched configurations at depths of 1 mm (mean lens fibre width: 5.7±0.29 μm, versus 5.7±0.52 μm, $p=0.411$), and at 5 mm (7.7±1.89 μm, versus 7.9±2.14 μm, $p=0.2309$ and at 6 mm (6±1.08 μm, versus 5.97±0.89 μm, $p=0.814$). An increase in mean lens fibre widths was observed in stretched lenses at depths 2 mm (mean lens fibre width: 6.9±1.76 μm, versus 7.9±1.9 μm, $p<0.0001$), and at 3 mm (8.9±2.42 μm, versus 8.98±2.326 μm, $p=0.0002$), lastly at 4 mm (8.45±2.8 μm versus 9.1±2.2 μm, $p=0.033$). A decrease in cortical lens fibre widths occurred (mean lens fibre width: 6.67±1.37 μm versus 5.65±0.29 μm, $p<0.0001$) at 7 mm.

Conclusion: Controversy exists as to whether nuclear lens fibres are altered during accommodation. This study shows that lens fibre width alters at some depths, but not in others during accommodation.

Biography

Saleha Al-atawi is a PhD student in Cardiff University. I have Master Degree of optometry from NSW University at Australia 2012 and my Bachelor Degree in optometry from king Saud University, Riyadh, Saudi Arabia 2007. My current research focus on understanding the eye lens structure under accommodation mechanism, Also, main interesting areas are eye health care, eye lens structure and cataract disease.

Notes: