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AUTHORS

AUTHORS (LAST NAME, FIRST NAME): Repetto, Rodolfo[1]; Davvalo Khongar, Peyman[1]; Pralits, Jan O.[1]; Siggers, Jennifer H.[2]; Soleri, Paolo[3]
INSTITUTIONS (ALL):
1. Department of Civil, Chemical and Environmental engineering, University of Genoa, Genoa, Italy.
2. Department of Bioengineering, Imperial College London, London, United Kingdom.
3. Ophtec BV, Groningen, Netherlands.
Commercial Relationships Disclosure (Abstract): Rodolfo Repetto: Commercial Relationship(s);Ophtec BV:Code F (Financial Support) | Peyman Davvalo Khongar: Commercial Relationship: Code N (No Commercial Relationship) | Jan Pralits: Commercial Relationship(s);Ophtec BV:Code F (Financial Support) | Jennifer Siggers: Commercial Relationship(s);Ophtec BV:Code F (Financial Support) | Paolo Soleri: Commercial Relationship(s);Ophtec BV:Code E (Employment)
Study Group:

ABSTRACT

TITLE: Numerical simulations of flow and mass transport processes in the anterior chamber in the presence of an iris-fixated intraocular lens

ABSTRACT BODY:
Purpose: In this study we investigated how implantation of iris-fixated intraocular lenses (IOLs) affects aqueous humor flow characteristics and mass transport processes in the anterior chamber. Specifically, we studied changes in the wall shear stress distribution and oxygen/nutrient availability on the cornea, after lens implantation.
Methods: We adopted a mathematical model to study aqueous flow and oxygen/nutrient concentration distribution in the anterior chamber in the presence of an iris-fixated IOL. Numerical solutions on idealized but realistic geometries were obtained employing the open source software OpenFOAM. The validity of the numerical results were confirmed by analytical solutions obtained through a simplified model based on the lubrication theory. We considered various mechanisms that generate aqueous flow in the anterior chamber and focused, in particular, on the production/drainage flow and the thermal flow generated by a temperature gradient across the anterior chamber.
Results: The model provides a detailed description of the velocity, pressure and concentration distribution in the anterior chamber, both in the presence and absence of the IOL. Results show that changes in fluid pressure after implantation of the IOL are negligible. Wall shear stress distribution and mass transport processes in the anterior chamber are significantly modified by the presence of the IOL. However, the maximum wall shear stress on the cornea does not grow after IOL implantation.
Conclusions: The study sheds some light on the changes induced by implantation of an iris-fixated IOL on fluid flow and mass transport in the anterior chamber, an information that would be difficult to obtain without making use of a mathematical model. Results suggest that changes in the wall shear stress, albeit significant, are unlikely to be the cause of the complications associated with the use of iris-fixated IOLs.
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Layman Abstract (optional): Provide a 50-200 word description of your work that non-scientists can understand. Describe the big picture and the implications of your findings, not the study itself and the associated details.: We employ a mathematical model to study how the implantation of an iris-fixated intraocular lens modifies aqueous humour flow and mass transport processes in the anterior chamber.

DETAILS

PRESENTATION TYPE: #1 Paper, #2 Poster

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Registration Number (Abstract):
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TRAVEL GRANTS and AWARDS APPLICATIONS

AWARDS: