Editorial

Human Eye: On the Importance of Novel Procedures and Devices based on Integrated Engineering-Medical Data

Alessandro Mauro*

Department of Engineering, Universita degli Studi di Napoli "Parthenope", Naples, Italy

***Corresponding Author:** Alessandro Mauro, Professor, Department of Engineering, Universita degli Studi di Napoli "Parthenope", Centro Direzionale, IsolaC4, 80143 Naples, Italy, E-mail: alessandro.mauro@uniparthenope.it

Received: 25 October 2018; **Accepted:** 26 October 2018; **Published:** 29 October 2018

Research activities in the field of ophthalmology are becoming more and more important, since a number of issues related to the complex physical phenomena occurring inside the eye must be addressed. Different coupled physical mechanisms need to be studied, such as biological processes, heat and mass transfer, interaction with porous media, fluid structure interaction and others. Surgeries on human eyes can be optimized thanks to the improvement of knowledge, based on scientific research findings. The practical consequence is that post-operative complications can be reduced, with increase of life quality.

As concerns the posterior section of the eye, a relevant example of surgery is represented by vitrectomy, which is an intraocular surgical procedure involving removal of vitreous gel to release the vitreoretinal traction, in order to treat the retinal tear and epiretinal proliferation. The procedure requires the continuum infusion of fluids, such as balanced salt solution or air, with the primary aim to maintain a constant intraocular pressure during the removal of vitreous gel. In order to avoid hypothermal condition, with consequent influence on the biological changes in ocular tissues that affect the normal operating condition of human body, the temperature of the infusion fluids should be properly controlled by employing novel heating devices [1-2].

As concerns the anterior section of the eye, a relevant example of surgery is represented by the glaucoma curing techniques. Glaucoma is an eye illness that affects humans and other mammalians, leading to a stage of total blindness. It is a major concern for ophthalmologists, as it is the second cause of eye vision loss worldwide [3]. Ageing and increased values of intraocular pressure (IOP) at the anterior chamber of the eye, generally above 21 mm Hg, are the main risk factors of glaucoma [4-6]. Therefore, curing treatments for glaucoma are targeted towards lowering IOP by means of various techniques. Among the available surgical procedures, the insertion of glaucoma drainage devices assumes a relevant role. These devices provide the increase of aqueous humour outflow, creating alternative outflow pathways, at the proximal region of conjunctiva and suprachoroidal space [4-8].

Patient-oriented based numerical models can be useful to further improve the present standards in the field of eye diseases. In fact, the use of a multidisciplinary technical-medical approach may provide a valuable engineering support to doctors, providing them with useful information based on specific patients' needs, with consequent reduction of post-operative complications.

References

1. Mauro A, Massarotti N, Salahudeen M, et al. Design of a novel heating device for infusion fluids in vitrectomy, Applied Thermal Engineering 128 (2018): 625-636.
2. Romano MR, Romano V, Mauro A, et al. The Effect of Temperature Changes in Vitreoretinal Surgery, Translational Vision Science and Technology 5 (2016): 1-10.
3. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020, British journal of Ophthalmology 90 (2006): 262-267.
4. Mauro A, Massarotti N, Salahudeen M, et al. A generalised porous medium approach to study thermo-fluid dynamics in human eyes, Medical and Biological Engineering and Computing 56 (2018): 1823-1839.
5. Mauro A, Romano MR, Romano V, et al. Suprachoroidal shunts for treatment of glaucoma: A comparison based on numerical simulations, International Journal of Numerical Methods for Heat and Fluid Flow 28 (2018): 297-314.
6. Mauro A, Massarotti N, Mohamed S, et al. A novel patient-oriented numerical procedure for glaucoma drainage devices, International Journal for Numerical Methods in Biomedical Engineering (2018).
7. Villamarin A, Roy S, Hasballa R, et al. 3D simulation of the aqueous flow in the human eye. Medical Engineering and Physics 34 (2012): 1462-1470.
8. Johnson M, McLaren JW, Overby DR. Unconventional aqueous humor outflow: a review. Experimental Eye Research 158 (2017): 94-111.

Citation: Alessandro Mauro. Human Eye: On the Importance of Novel Procedures and Devices based on Integrated Engineering-Medical Data. Journal of Ophthalmology and Research 1 (2018): 6-7.