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Laser Keratoplasty in Human Eye Considering the Fluid Aqueous Humor and Vitreous Humor Fluid Flow

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Abstract : In this paper, conventional laser Keratoplasty surgeries in the human eye are studied. For this purpose, a validated 3D finite volume model of the human eye is introduced. In this model the fluid flow has also been considered. The discretized domain of the human eye incorporates a bio-heat transfer equation coupled with a Boussinesq equation. Both continuous and pulsed lasers have been modeled and the results are compared. Moreover, two different conventional surgical positions that are upright and recumbent are compared for these laser therapies. The simulation results show that in these conventional surgeries, the temperature rises above the critical values at the laser insertion areas. However, due to the short duration and the localized nature, the potential damages are restricted to very small regions and can be ignored. The conclusion is that the present day lasers are acceptably safe to the human eye.

Keywords : eye, heat-transfer, keratoplasty laser, surgery
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