

Abstract Submitted
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On the fluid dynamics of tonometry: An experimental and theoretical approach SAPTARSHI BASU, DURBAR ROY, SOPHIA M, ABDUR RASHEED, Department of Mechanical Engineering, Indian Institute of Science, PRASENJIT KABI, Interdisciplinary Centre of Energy Research, Indian Institute of Science — This work addresses the fluid dynamics involved during an ophthalmologic procedure called tonometry that is used to measure the intraocular pressure of human eye. The mechanisms involved during tonometry were studied experimentally and theoretically in detail for dry and teary eye conditions using real human subjects. High speed imaging was used to capture the transient three-dimensional fluid mechanical processes that are involved. An air puff is ejected from the nozzle which is kept at approximately 10mm from the eye. It has been found that the air puff has a leading vortex and a trailing jet. The leading vortex approaches the eye which increase the air velocity field locally as a result the local pressure reduces causing an initial sheet ejection for wet eye. Wet eye is simulated by using eye drops before undergoing the tonometry technique. While the sheet ejects out of the eye the trailing jet hits the cornea leading to a deflection which causes capillary waves on the surface of the eye. The sheet expands in two phases first due to the leading vortex and then due to the trailing jet. Due to the highly transient and three-dimensional nature of the flow, bag like structures begin to appear which undergo disintegration into droplets by Rayleigh Plateau breakup.

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