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Goldmann applanation tonometry training: Past, present and future

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Introduction: Goldmann Applanation Tonometry (GAT), the gold standard technique for intraocular pressure measurement was developed in the 1950s by scientist Hans Goldmann. GAT utilizes the Imbert-Fick Principle where intraocular pressure equals the contact force required to flatten, divided by the area of contact on an infinitely thin-walled sphere. An unskilled practitioner can cause harm to a patient during performance of GAT by potentially causing corneal abrasions, incorrect IOP measurements, or risk of cross infection. Numerous other techniques have been developed, such as Tonopen, Ocular Blood Flow tonograph (OBF), NonContact Tonometer (NCT), and Transpalpebral Tonometer, due to the complicated technical aspects of GAT. However, GAT remains to be the most accurate IOP check technique across ophthalmology practices, as the interobserver reliability is lower for other techniques. While GAT is the gold standard for IOP measurement it also requires a high skill of operation, thus appropriate training is critical. Present day training requires a courageous volunteer to act as a patient. Physical models acting as artificial globes have been developed for training but require materials that may not be easily accessible and have associated costs. To advance training in the modern age, we developed an online application which mimics the steps of GAT and is free to use for trainees at gatsim.com.

Methods: A website was created using HTML and JavaScript ES6, tested on Google Chrome version 103.0, hosted on GitHub. The code is publicly available at <https://github.com/ryerrabelli/TonometrySimulation>.

Results: We developed an online application which mimics the steps of GAT and is free to use for trainees at gatsim.com. Trainees can now train on our model before seeing patients, which may ultimately improve outcomes. To our knowledge, this is the first time ever an online simulation of Goldmann Applanation Tonometry has been developed. This will allow individuals to train and learn the mechanics of GAT via an easy-to-use online application. We hope such technology will improve the skills of trainees, hasten the time to reach expertise, and minimize potential patient complications.

Biography

Ashkhan Hojati is a 4th year medical student at Carle Illinois College of Medicine at University of Illinois Urbana-Champaign. He graduated in 2016 with a BS in Biomedical Engineering from VCU and received his MS in Physiology & Biophysics at VCU Medical Center in 2019. He has held multiple research positions at VCU Medical center and has published and presented on a variety of topics including molecular psychiatry, medical device design, and pharmaceuticals.

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