Commentary: Intravitreal injection of formalin as a life hack for ophthalmic wet lab training

The authors of the accompanying article "Formalin assisted training eyes (FATE) for ophthalmic wet lab practice"[1] demonstrate a very simple and inexpensive trick that will help all the ophthalmic residents struggling to practice steps of eye surgery during this pandemic. They note that cadaver eyes or animal eyes for wet lab surgical practice are often collapsed and unusable for training. With this simple "life hack," they are able to revive these eyes for surgical training.

Intravitreal injection before cataract surgery practice

The authors tried intravitreal injection of saline, viscoelastic, and formalin to show that formalin was most effective. Although formalin can be obtained from a lab supply store, it may be an inconvenience for many and prevent widespread use of this trick. I wonder if hand sanitizer, alcohol, vinegar, or other chemicals available at home would also work in the same manner by denaturing proteins in the vitreous cavity? That would make it even more accessible to more trainees.

Human cadaver eyes

Human cadaver eyes from eye donation which are not usable for transplant would be ideal for practicing surgical steps. This often means that the globe is collapsed or cornea hazy. This trick of intravitreal formalin injection[1] would help to use these eyes with the proper firmness of the globe to allow practicing surgical steps of cataract, glaucoma, and cornea surgeries. Do note that viscoelastic material (leftover from the operating room) is injected into the anterior chamber as well.

SAFEly fixing the eyeball

The conventional eyeball stand in the wet lab is not very effective for a collapsed eyeball, as it just holds a part of the globe in a ring with no counterpressure. Another innovation from the same institute is an eyeball fixation stand called a Spring-action Apparatus for Fixation of Eyeball.[2] This is a big help in wet lab for firmly fixing a collapsed globe and making it usable for surgical practice. Intravitreal formalin would be a great addition to this technique.

Butcher shop eyes

Most surgical wet labs in India use animal eyes, most often goat or pig eyes. Though the shape and tissue feel is different, this is very useful for ophthalmic surgical training as it is easily available. The residents often have to phone up the butcher early in the morning so that they keep aside the eyes of the animals butchered that morning.

Kitchen ophthalmic surgeon

We had made a fun and interesting video showing how the kitchen can be transformed into a wet lab that would be useful for surgical trainees.[3] The video is available on YouTube

and demonstrates surgical practice on fruits and vegetables including pupilloplasty and iridodialysis repair.

Commercial model eyes

Model eyes for surgical practice are available, some tailormade for different ocular surgeries. This might be a good option for those who can afford them.

3D-printed model eyes

Additive manufacturing or 3D printing[4] has been used to make model eyes for LASER practice[5] and surgical practice.[6] This allows designs to be made and modified collaboratively and shared across the world. The actual cost of 3D printing a model in poly lactic acid, acrylonitrile butadiene styrene or silicone is not too expensive.

Virtual reality simulators

Virtual reality is another technology that can be used for wet lab training.[7] Virtual reality and augmented reality devices can be used for surgical training. Commercial ophthalmic surgical simulators such as EyeSi for phacoemulsification and HelpMeSee for manual small incision cataract surgery provide a very realistic experience[8] and reduce the surgical complications of trainees.[9]

Smartphone surgery simulators

There are also a few smartphone apps such as caractMobile[10] and cataractDroid which allow you to practice capsulorhexis and phacoemulsification steps on a smartphone.

Future of ophthalmic surgical training

The future will have better and affordable surgical training accessible to all trainees. Artificial intelligence[11] would allow continuous monitoring and feedback of the surgeon's every move.

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