“Practice makes perfect” is an age-old idiom few can disagree with. Yet in ophthalmic surgical teaching, practice has not had the emphasis it has in other motor skill–based disciplines. Even a well-stocked wet laboratory likely does not have a large quantity of eyes available for practicing, limiting robustness of skill development that could be achieved by frequent repetition. The commonly used pig eyes have only superficially similar surgical characteristics to human eyes, reducing the benefit of the time invested. The lack of corneal clarity is a common problem of both human cadaver and animal eyes. Some maneuvers may be difficult to practice outside of the operating room, such as administering regional ophthalmic anesthesia: peribulbar or retrobulbar blocks. As a result, trainees usually begin surgery on patients before skills are well developed.

In contrast, disciplines requiring a degree of motor skill proficiency emphasize significantly more practice and rehearsal. In aviation, airline pilots spend a great deal of time using simulators to acquire robust and mature skills necessary to safely fly an airplane. Athletes and musicians spend an enormous amount of time in practice and rehearsal before game day or recital.

Although the idea of practicing techniques and maneuvers before going to the operating room is not new, the availability of modern simulators is. With the advent of laparoscopic surgery, many surgeons and residents needed to learn skill sets that were somewhat difficult to acquire, yet crucial for safe surgery. Simple simulators, or “box trainers,” emerged and facilitated the development of laparoscopy-specific skills. In time, virtual reality laparoscopic trainers were developed to give a more realistic experience for the learner. By using these technologies, new skills applicable to laparoscopic surgery could be learned, and the surgeons who practiced with box trainers or simulators arrived in the operating room with greater skill and enjoyed shorter learning curves.1,2

Surgeons are now capable of practicing surgical procedures as often as necessary to become expert, at least in the simulation environment, with increasingly sophisticated simulation technology. Such practice may require dozens or hundreds of attempts or repetitions to accomplish a certain task, maneuver, or develop a new skill. Modern simulators often use virtual reality to increase realism and facilitate suspension of disbelief. They also give valuable and important feedback, limited only by the level of sophistication of the simulator’s software.

In ophthalmology, there are currently 3 cataract surgery simulators available: Eyesi (VRmagic Holding AG, Mannheim, Germany), MicroVisTouch (ImmersiveTouch, Chicago, IL), and PhacoVision (Melerit Medical, Linkoping, Sweden). All 3 of these simulators use virtual reality technology. Only the Eyesi has scientifically validated construct validity for most tasks, that is, novices perform worse than experts who already have the skill that is to be taught on the simulator.3 Many ophthalmology resident training programs worldwide have these modern simulators for their trainees, and some require completion of simulation-based curricula before performing surgery in the operating room. There is a growing body of literature that demonstrates the utility of the simulators. Trainees arrive with more skill in the operating room than before simulation learning was available.4,5

To date, there has been little attention paid in ophthalmology to allow an objective and thorough out-of-the-operating-room learning experience for administering ophthalmic regional anesthesia, such as peribulbar or retrobulbar blocks. Although complications from these blocks are rare, they can have devastating outcomes, ranging from blindness due to globe and optic nerve needle penetrations to death due to subdural or intra-vascular anesthetic injection with resultant brain stem anesthesia and respiratory arrest.6–8

In this issue of Ophthalmology, Mukherjee et al9 share their experience with an Ophthalmic Anesthesia Simulation System for Regional Block Training that they developed and tested in a prospective study (see http://www.aaojournal.org/article/S0161-6420(15)00738-1/ fulltext).10 The device consists of a mannequin head with anatomically accurate orbital and ocular structures, and an integrated sensing system that is capable of providing quantitative and qualitative feedback on needle location, and therefore the avoidance, or lack of avoidance, of critical ocular and orbital structures during the injection procedure.

The system is designed to track crucial steps in the administration of regional anesthesia around the eye, including identification of the correct eye to be blocked, identification of the correct needle entry site, assessment of maneuvering the needle in the intraorbital space, avoidance of damage to extraocular muscles or the globe, aspiration of the syringe before anesthesia injection, and assessment of the local anesthetic solution administration rate. Furthermore, the system is configurable so that differing teaching goals can be met; for example, the need for supplemental supranasal anesthesia injection can be added or omitted. As such, the system is well thought out to allow meeting the expectations of a range of learning goals for regional anesthesia.
In a repeat measure study, ophthalmic regional anesthesia was assessed among trainees and experienced consultants. In the initial training, subjects received no feedback during the 3 assessments of regional block performances spread over 2 days. After 2 days without using the simulator, each subject repeated the regional block administrations sequence as before, but with feedback provided by the simulator turned on. The no feedback sequence of injections did not result in an improvement in performance scores, unlike the with feedback sequence, which did result in significant performance score gains. As such, they showed the importance of feedback to the learners for improving their scores and therefore their technique. Of note, the study demonstrated that the experts (consultants) participating in the study had significantly higher scores than the trainees during the initial injection sequence without feedback, demonstrating construct validity of the simulator.

Adopting sophisticated simulation technology with feedback provided by the system allows for objective, structured training to a high level of skill. Mukherjee et al have provided a sophisticated teaching tool to ophthalmic educators so that regional ophthalmic anesthesia may be learned without exposing patients to trainees with immature skill, and the inherent risks involved. Refined simulation technology is becoming increasingly more important and relied on in medical and ophthalmic surgery teaching, because, after all, “Practice makes perfect.”

References


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