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LETTER TO THE EDITOR

Tomatoes Today, Eye Surgeons of Tomorrow: Microsurgery Suturing Simulation for Medical Students

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Abstract

Surgical simulation falls under the broad categories of virtual reality simulation, animal or cadaveric eye simulation, and low-cost simulation. During the COVID-19 pandemic, at-home surgical simulation was sought after as trainees and surgeons had reduced operating hours. We demonstrate a high-fidelity and low-cost simulation for ophthalmic microsurgical suturing using a cherry tomato. The model was utilized at the Australasian Students Surgical Conference, 2022 on the Gold Coast, Australia, to a total of 120 medical students.

To the Editors, since the 19th Century, traditional surgical education has followed the maxim of "see one, do one, teach one."[1] The traditional approach has attracted criticism due to compromised patient safety. Patients operated on by surgeons with less experience have prolonged hospital admission, increased number of complications, and greater mortality.[2] There has been a shift away from the traditional teaching model to surgical simulation. Surgical simulation falls under the broad categories of virtual reality simulation, animal or cadaveric eye simulation, and low-cost simulation.

The Eyesi simulator (Haag-Streit GmbH, Koeniz, Switzerland) is a virtual reality simulator that offers cataract surgery and vitreoretinal surgery simulation. Since becoming commonly used in the United Kingdom, the Eyesi simulation has been associated with a reduction in posterior capsule rupture rates for junior ophthalmic surgeons by 38% from 2009 to 2015.[3] Other virtual reality simulation platforms include MicroVisTouch simulation performance, PhacoVision simulator (Melerit Medical, Gothenburg, Sweden), and VitRet eye (Phillips Studio, Bristol, UK). The disadvantages of virtual reality simulators are the high start-up and ongoing software maintenance costs as well as the travel time to the nearest simulation laboratory. Animal or cadaveric eye simulation shares the disadvantage of high recurring costs for multiple eyes, difficulty in attaining pig or cadaver eyes, and potential biohazard for surgical practice.

Low-cost and high-fidelity ophthalmology surgical simulation has a growing literature base. During the COVID-19 pandemic, at-home surgical simulation was necessary for trainees and surgeons alike to ensure ongoing practice and reduced anxiety and complications when returning to the operating room. The difficulty for some trainees to access virtual reality simulation

Figure 1: Student practicing microsurgical skills on a cherry tomato mounted in a plastic face mask, utilizing a self-mounted illuminated 2× magnifying lens. 101 × 76 mm (300 × 300 DPI)

Figure 2: Ophthalmic consultant demonstrating microsuturing technique, projected live on the big screen, together with one of the student groups. 101 × 76 mm (300 × 300 DPI)

has made at-home surgical simulation models more attractive. Low-cost models described in the literature include using an apple covered in glad wrap to simulate trabeculectomy surgery, suturing a circular piece of orange peel to the remainder of the orange peel to simulate corneal transplant surgery, and operating inside a lozenge packet to simulate cataract surgery.[4]

We demonstrate a high-fidelity and low-cost simulation for ophthalmic microsurgical suturing. A cherry tomato was chosen to simulate the globe. Cherry tomatoes were selected with a diameter of approximately 25 mm and their skin thick enough to reduce cheese wiring of the suture. Other varieties of tomatoes were trialed including baby roma, solanato, and grape tomatoes; however, the flesh and skin were found to be less robust. Tomatoes cultivated under water stress conditions also have a thicker cuticle; thus, there may also be seasonal variation.[5]

A 7–0 polyglycolic acid braided suture on a 3/8 circle spatulated needle was used for our demonstration. A larger suture was chosen for medical students starting their suturing experience; however, 10–0 Nylon sutures could also be used for more advanced trainees. The cherry tomato was fixed with adhesive tape into the eye holes of a white plastic face mask [Figure 1].

The mask was used to simulate the hand positioning during surgery, with the hands lightly resting on the cheek and forehead area. As an optional measure, to reduce cheese-wiring of the suture through the tomato flesh, a small area of the tomato can be coated with nail varnish and a linear mark drawn with a permanent fine marker to simulate the lesion and a further layer of clear nail varnish applied. It is important to have the tomato dry and at near room temperature before applying nail varnish and to avoid refrigerating the tomato as the condensation reduces the adherence of the varnish. This step can be done in advance of the practice session. A 2× magnifying lens with illumination was used to provide magnification. Other instruments required include disposable fine needle holders (Surgitrac Instruments UK Ltd, Manchester, UK), tying forceps, and scissors to cut the suture.

The model was utilized at the Australasian Students Surgical Conference, 2022 on the Gold Coast, Australia, to a total of 120 medical students. Four groups of 30 students, sharing two tomatoes per head rotated through a 45 min session, consisting of a demonstration [Figure 2] projected on the big screen and then hands-on practice with one consultant ophthalmologist tutor per group.

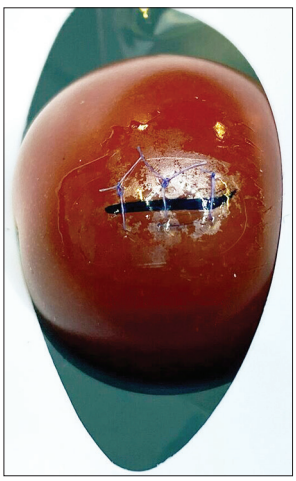

Figure 3: Prize-winning example of three interrupted sutures applied to the cherry tomato by one of the medical students. 101 × 76 mm (300 × 300 DPI)

A survey of the medical students following the workshop found that despite little or no previous suturing experience, they felt more confidence in microsurgical suturing by the end of the session. In terms of ability, some attendees found microsurgery quite challenging, while others performed it with relative ease. This provided the students a degree of insight into their abilities and potential decision-making for future career prospects. A prize was presented for the best three sutures performed [Figure 3].

The advantage of this model is the low-cost setup, as well as the easily sourced and non-biohazardous cherry tomato to use

for ongoing practice for medical students and surgical trainees. Although real ocular tissue handles differently, many of the skills acquired can be translated for use in actual practice.

Declaration of Interest

None.

Acknowledgment

None.

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