

A novel simulation model for penetrating keratoplasty

Dear Editor,

COVID-19 pandemic has significantly disrupted postgraduate surgical training programs all over the world secondary to lockdowns, with reduction or suspension of nonelective surgeries. With the pandemic lasting longer than expected, simulation-based training has played a more pronounced role in residency and fellowship training programs.^[1] Despite the introduction of lamellar and endothelial keratoplasty, penetrating keratoplasty (PKP) remains a widely performed procedure^[2] and hence a core training skill requirement for ophthalmology residents and fellows. Wet labs using animal^[3] and cadaver^[4] eyes are commonly used to practice PKP. However, animal and cadaver eyes may not be readily available to all trainees. Cost can be a barrier in some countries. In addition, animal and cadaver eyes require specific precautions for preservation and disposal. We describe a novel simulation model without these constraints that allows trainees to practice all of the surgical steps of PKP using affordable, commercially available materials [Supplemental video content]. The supplies of this simulation model consist of a transparent rubber toy (splat ball toy) as a donor button and an orthodontic pacifier as a recipient host tissue [Fig. 1].

Advantages of this model include the availability and affordability of the materials (USD 5.00 per simulation with the materials used here). Additionally, compared to animal or cadaver eyes, the clarity of the material allows for better evaluation of the suture depth, position, orientation, and length. It also allows for repeated attempts at placing sutures without the tissue becoming hazy or friable. The model can be used more than once, as opposed to animal or cadaver eyes. This model requires no preservation and produces no biohazardous waste. The primary disadvantage is that the recipient silicone pacifier is thicker and stiffer than the human cornea; as such, trephination is less realistic. However,



Figure 1: A photograph featuring the materials used for this PKP simulation model. (a) medium-sized orthodontic pacifier (6–18 months), (b) clear rubber splat ball toy, (c) corneal trephine, (d) corneal punch

suturing of a PKP is the most important step to practice for a trainee, and this model closely replicates corneal tissue behavior.

In summary, this cost-effective model provides a simulation of PKP and suturing training. The described PKP simulation model can assist ophthalmology and cornea specialist trainees to practice the steps of PKP in a safe environment. Trainees can develop the skills required for obtaining an optimum water-tight result with minimal astigmatism by practicing on this model as many times as needed until they acquire the skills needed to achieve proper position, tension, and length of the PKP sutures before they operate on patients' corneas.

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Conflicts of interest

There are no conflicts of interest.

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