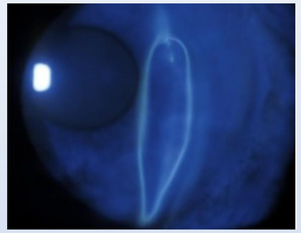
Corneal Perforation: A Simulated Formal Educational Programme at Moorfields Eye Hospital

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Seidel positive: Corneal perforation seen with fluorescein

SCAN ME FOR THE VIDEO DEMONSTRATION!

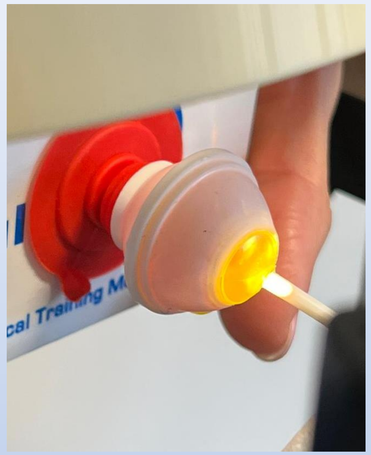
Background

Corneal perforations are ocular emergencies. Common aetiologies include trauma, infection and autoimmune disease.[1] Timely diagnosis and treatment are paramount to avoid sight-threatening complications, yet formal teaching opportunities are rare and it is often performed under pressure in an emergency and/or out of hours where supervision may be limited. Traditional models of simulation (with animal cadavers) do not adequately replicate the tissue texture of the human cornea or the upright position of the patient at the slit lamp.[2] Our aim was to create an educational package with step-by-step instructions and a video demonstration, complemented by a highly realistic simulation, to ensure trainees were confident to perform the procedure correctly.

Methods

An educational programme on managing corneal perforation was created for ophthalmology trainees. Step-by-step, illustrated instructions and an online demonstration video https://www.youtube.com/watch?v=od7Af17WCTQ were provided. Trainees were invited to attend one-to-one simulation sessions. Our novel simulation consisted of a Phillips Studio SRT-Head and eye, or an Altomed model eye, discarded after being used for cataract/laser simulation, secured upright in the slit-lamp, as a patient would be sitting. The model eye cornea was purposefully punctured to replicate perforation. The anterior chamber was filled with balanced salt solution using a syringe and 23g needle, to replicate the subtle leak of aqueous fluid. The corneal perforation was repaired using a cyanoacrylate glue method with a sterile cotton tip and punctured disc of a sterile plastic drape. The novel simulation was assessed alongside traditional pigs' eyes and the feedback compared. The intervention was validated using pre- and post-teaching questionnaires.





Altomed model eye used in simulation

Results

Nineteen ophthalmology trainees took part in the educational programme. Twelve trainees attended the practical simulation session. In the pre-intervention questionnaire, 100% (19/19) of trainees stated that step-by-step instructions with a video demonstration would be useful and 84% (16/19) stated that face to face simulation sessions would be useful.

In the post-intervention questionnaire, all participants 100% (12/12) stated that the simulation improved their confidence in managing corneal perforations; 84% (16/19) of trainees stated that the instructions and video were 'very useful'. The simulation session was rated as 'excellent' by 67% (8/12). The written feedback was unanimously positive, comments included, 'very useful and realistic', 'very clear theory and practical'.

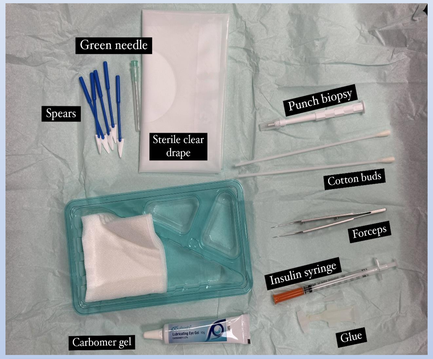
When asked which type of simulation they preferred 67% (8/12) preferred the novel model eye on the slit lamp compared to the traditional pig's eye. Validity was the most frequently documented reason, i.e. preferring a more realistic experience with using the slit lamp.

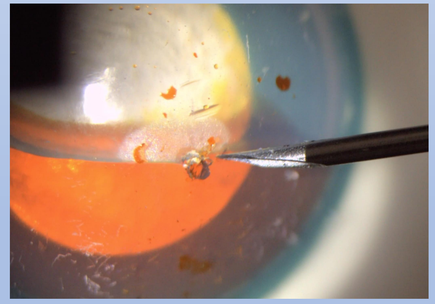
Conclusion

Simulation allows trainees to acquire significant experience and technical skills without risk to patients. This simulation was completed at minimal cost, using discarded model eyes. To our knowledge, this is the first highly-realistic, simulated education package to address this key procedure that does not require the use of animal cadavers. Similar techniques have recently been introduced using eggs.[3]



Ophthalmology trainee during simulation





Video demonstration providing step-by-step instruction: Screenshots of the materials required and method for debriding the corneal epithelium with a needle.

References

[1] Stamate AC, Tătaru C, Zemba M. Update on surgical management of corneal ulceration and perforation. Rom J Ophthalmol. 2019;63(2):166–73.
[2] Bafna RK et al. Management of small perforated corneal ulcers: Training model in mammalian eye to enhance surgical skills of residents. Eur J Ophthalmol. 2022 Mar 25;32(2):1276–9.
[3] Fu L, Hollick EJ. A novel simulation model for corneal gluing. Eye (Lond). 2023 Feb;37(2):371-372. doi: 10.1038/s41433-022-02184-2. Epub 2022 Aug 1. PMID: 35915235; PMCID: PMC9873907.