

Teaching High-Acuity, Low-Occurrence Procedures: Development of a Simple Model for Lateral Canthotomy

Authors: Dr Rohan Aziz, Dr Charles Horner, Dr Luke Murphy, Dr Makeda Kingue-Sousseing, Dr Christopher Stenning, Dr Win Mon
Institution: Dartford and Gravesham NHS Trust



INTRODUCTION

- Orbital compartment syndrome (OCS) is a sight-threatening emergency caused by rapid rises in intra-orbital pressure, most commonly from retrobulbar haemorrhage after trauma. Without urgent decompression, irreversible vision loss can occur within 90–120 minutes (1)
- Lateral canthotomy and cantholysis (LCC) is the definitive bedside treatment and a mandated competency within RCEM and RCOphth curricula (2,3)
- Despite this, LCC remains a High-Acuity, Low-Occurrence (HALO) procedure: rarely encountered yet requiring immediate, confident execution. Only 37% of UK emergency physicians feel prepared to perform LCC independently, with 91% citing limited training (4).
- Existing simulation options have significant limitations: porcine and human cadaveric models are costly, single-use, and logistically complex (5,6) . Commercial synthetic trainers may cost over £290 (7). Low-fidelity designs lack whole-face topography and often struggle to replicate the mechanical distinction between canthotomy and cantholysis (8).
- Agar-based globes have shown promise in corneal foreign body training by replicating realistic globe resistance, but have not been adapted for LCC (9).

- Aim:** To design, deliver, and evaluate a low-cost, whole-face LCC simulation model that addresses these limitations and provides an accessible, high-yield training tool for emergency medicine clinicians

METHODS

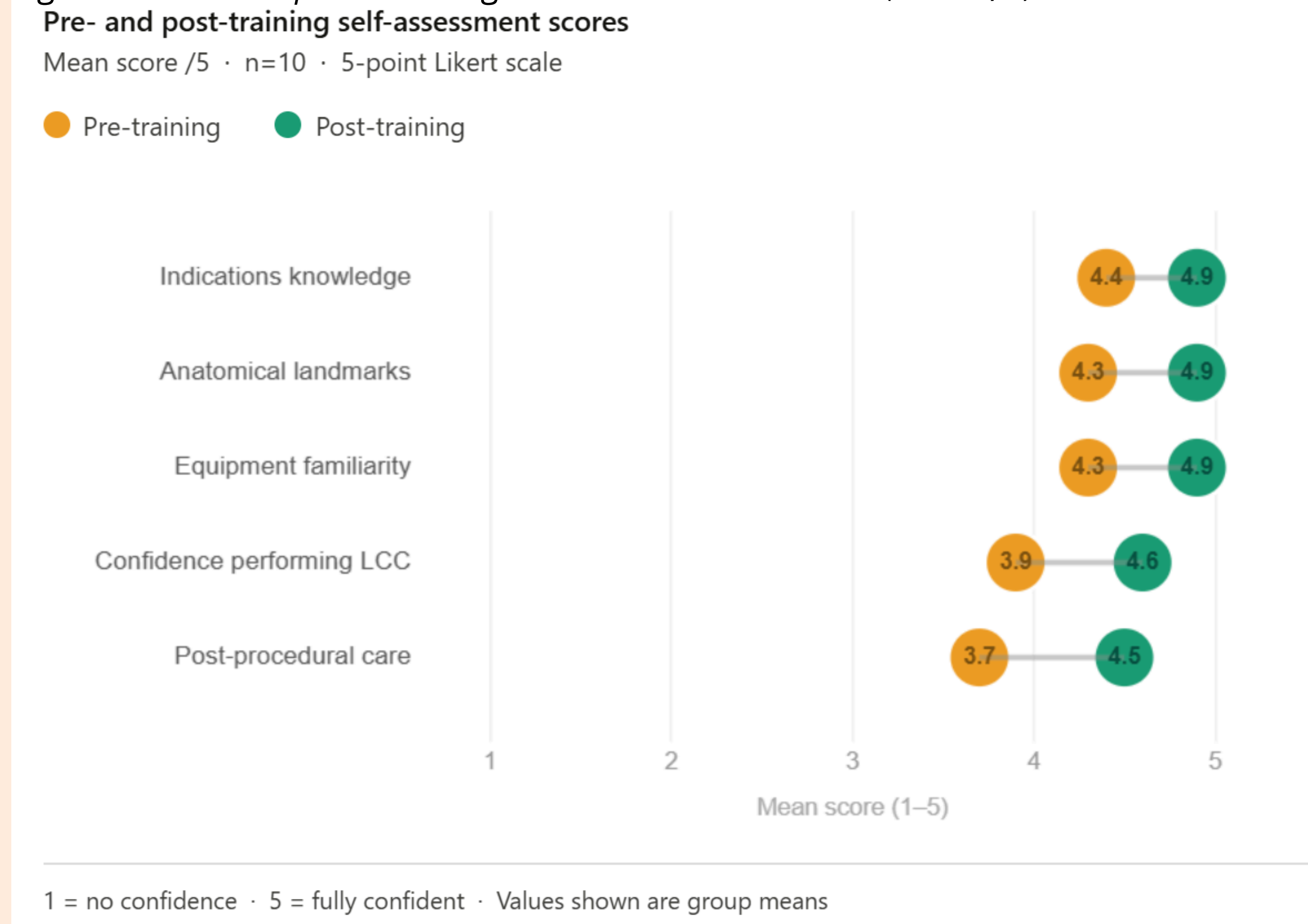
- A prospective service evaluation conducted within a single Emergency Department in a suburban district general hospital in the UK
- Participants attended a 1-hour structured workshop including overview of OCS and LCC , demonstration and supervised practice
- Evaluation comprised of a Pre- and post-training self-assessment (5-point Likert scale, five domains) and a questionnaire with qualitative feedback
- Model Construction: Total material cost <£5 per unit with reset time <2 minutes between users.

Component	Material	Component
Framework	Cardboard craft face mask + gummed tape	Whole-face craniofacial topography; waterproofed against agar moisture
Anchoring	Drawing pins, positioned lateral to orbital tubercle	Rigid bony attachment points for tendon analogue
Tendon	Knotted elastic band (superior + inferior crura)	Lateral canthal tendon complex; must be strummed and divided independently
Soft tissue overlay	Micropore tape + Elastoplast	Skin and orbicularis oculi simulation; conceals blood capsules
Haemorrhage	Halloween Blood capsules (concealed under overlay)	Immediate visual feedback on tissue entry
Globe	Agar jelly eye	Firm resistance of a proptotic globe

Figure 1: simulation model components and construction

RESULTS

Figure 2: Pre- and post-training self-assessment scores (mean /5)



- Participants:** 10 clinicians (8 ST4+/Registrar, 1 ACP, 1 Consultant).
- Training background:** 50% no formal LCC training; 20% informal; 30% formal.
- Experience:** <4yrs (20%), 4–7yrs (30%), >7yrs (50%).
- Model realism:** Tendon 4.8/5; Top ography 4.9/5.
- Qualitative comments:** described the model as providing “exceptional hands-on practice” and “the best LCC simulator I’ve encountered.”

DISCUSSION

- This low-cost whole-face model provides high functional fidelity at <£5 per unit, avoiding the cost, logistics, and limited reusability of cadaveric and commercial simulators. Its rapid reset time (<2min) supports repeated deliberate practice in routine departmental teaching.
- The agar globe offers realistic proptosis-like resistance and is inexpensive, biodegradable, and reproducible
- The elastic-band tendon reliably enforces the canthotomy–cantholysis distinction, the step most often unfamiliar and incorrectly performed in emergencies. High realism ratings (4.8/5) support its educational value.
- The whole-face paperm mask provides essential topographic cues (e.g. nasal bridge and orbital rim), improving spatial orientation and hand positioning - a key limitation of isolated-eye models. Participants rated this feature highly (4.9/5).
- Confidence improvements align with published low-fidelity LCC training studies, with this cohort achieving higher post-training confidence (4.6/5; 90% ≥4/5), likely reflecting both seniority and the added realism of whole-face topography.
- Limitations:** include small sample size (n=10), single-centre design, and reliance on self-reported outcomes.
- Multi-site expansion, objective performance assessment are planned and further data collection is ongoing

CONCLUSION

- The model produced consistent, measurable improvements across all five self-assessed domains in a single structured session with LCC confidence rising from **3.9 → 4.6/5** and **≥4/5 ratings increasing from 70% → 90%**.
- Post-procedural care confidence improved from **60% → 90%**, and near-ceiling evaluation scores (all ≥4.8/5) demonstrate strong face validity, educational utility, and high participant engagement.
- With a material cost <£5, no specialist infrastructure, and sub-two-minute reset time, the model is a sustainable, scalable alternative to commercial synthetic and cadaveric simulators.
- The design reliably reinforces the canthotomy–cantholysis distinction and provides whole-face topography, addressing key limitations of existing low-fidelity trainers and supporting HALO procedural training.

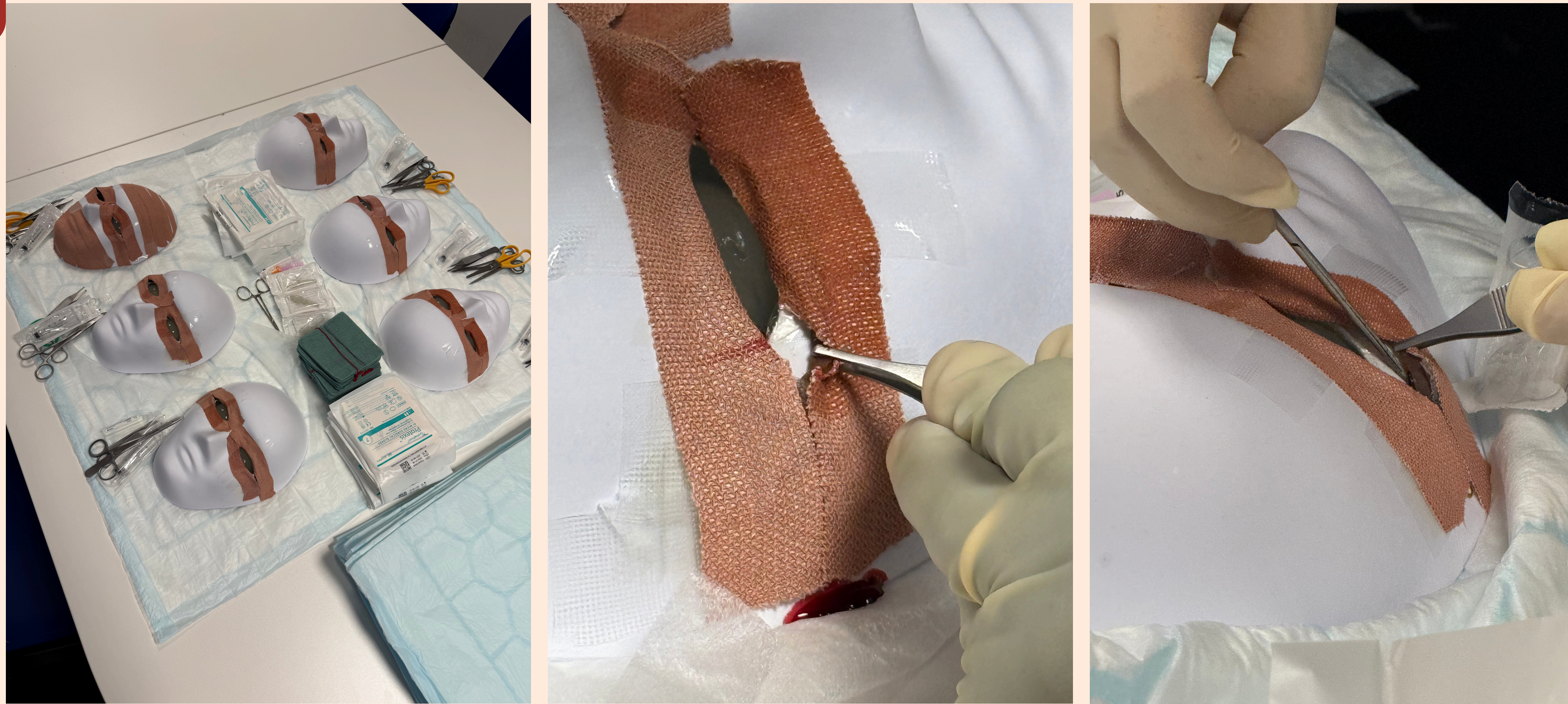


Figure 3: Lateral canthotomy simulation in use

Scan the QR code for a full step-by-step model creation guide



REFERENCES

- Timlin HM, Bell SJ, Uddin JM, Osborne S. Treatment outcomes of lateral canthotomy and cantholysis for orbital compartment syndrome. Br J Oral Maxillofac Surg. 2019;57(5):488–490. PMID: 31005347.
- Royal College of Emergency Medicine. RCEM Emergency Medicine Curriculum 2021. Master Version 1.5 (2023). London: RCEM; 2023. Available from: https://rcem.ac.uk/wp-content/uploads/2023/03/RCEM_Curriculum_2021_Master-Version-1.5-2023.pdf
- Royal College of Ophthalmologists. Ophthalmic Specialist Training Curriculum: Curriculum 2024 Handbook (August 2024). London: RCOphth; 2024. Available from: <https://www.rcophth.ac.uk/wp-content/uploads/2024/05/Curriculum-2024-Handbook-August-2024.pdf>
- Edmunds MR, Nderitu P, Chaudhary T, et al. Management of acute retrobulbar haemorrhage: a survey of non-ophthalmic emergency department physicians. Emerg Med J. 2019;36(12):730–734. PMID: 30630842.

5. Suner S, Simmons TW, Blanda M, et al. A porcine model for instruction of lateral canthotomy. Acad Emerg Med. 2000;7(6):710–712. PMID: 10917338.
6. Patel SR, Mishall P, Barnettler A. A human cadaveric model for effective instruction of lateral canthotomy and cantholysis. Orbit. 2020;39(2):87–92.
7. Eyelid Training. Kantho Lid – 3D Eyelid Model for Canthoplasty Training. Available from: <https://www.eyelidtraining.com/buy/p/kantho-lid-eyelid>
8. Kong R, Kaya DP, Cioe-Pena E, Greenstein J. A low-fidelity eye model for lateral canthotomy training. Afr J Emerg Med. 2018;8(3):118–122. PMID: 30456160.
9. Tan CL, Dhanda J, Bhatt DL, Maddison J. A low-cost surrogate eye model for corneal foreign body removal. BMC Ophthalmol. 2020;20(1):55. PMID: 32028904