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Technical note

Low-cost model using a digital microscope for learning, practicing, and maintaining microvascular surgical skills

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The recent COVID-19 outbreak has seen the majority of courses cancelled due to government policies during the acute pandemic.¹ This unfortunately has had a knock on effect on the progression of training, especially with respect to microvascular surgery, as it is thought that a trainee should be fully trained outside the operating room. The practice of microvascular surgery is extremely complex and a trainee should be taken through a number of validated steps prior to progression.² The first author has sourced a cheap and portable model for developing key skills for microsurgery.

Obtaining a microvascular microscope can be costly and even on the secondhand market it can cost more than £800. The other problem is the issue of space and portability. A search on eBay, Amazon, and AliExpress for digital microscopes revealed many portable digital microscopes selling within the range of £30 to £60, depending on the functions required. The digital microscope allows recording via a microSD card which allows the trainer to provide feedback on technical skills (Fig. 1). It also takes up a small amount of space, allowing the user to bring it conveniently home or to work (Fig. 2). The first author has found a digital microscope with a zoom function claimed by the manufacturer to range from 1 to 600×. We have not validated this claim, but the magnification is sufficient to practice on 10/0 Ethicon® Ethilon round-bodied sutures. It is also possible to practice using high-ended camera phones, but some users may avoid this



Fig. 1. Setup of a digital microscope for use.

due to the cost. We have listed advantages and disadvantages of each device in the table below (Table 1).

The other materials required to practice microsurgery include surgical instruments and materials. Microsurgical instruments can be purchased from eBay with an average price range of around £30, but this depends on the quality required by the user. Many articles have already been written about the use of latex rubber gloves and femoral vessels obtained from chicken thighs for the practice of microvascular anastomosis (Fig. 3).^{2–5} There are also many reputable microsurgical university centres that have free technical videos available online for those interested in self-directed learning.

We are of the consensus that this would not replace a microvascular course and experience would depend on the type of digital microscope purchased in terms of ease of

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Fig. 2. The size of a digital microscope relative to a surgical microscope.

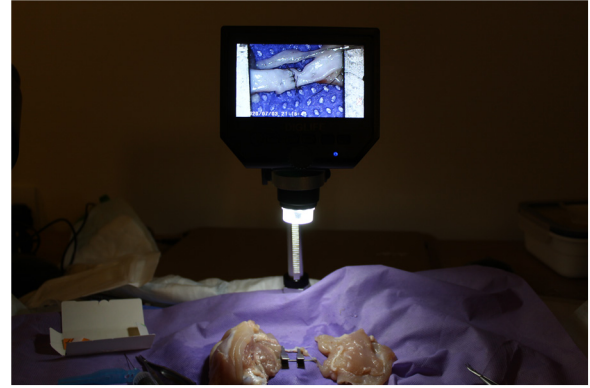


Fig. 3. The use of femoral vessels in chicken thighs for practice with 10/0 Ethicon® Ethilon round bodied 5.1 mm 3/8c sutures.

adjusting magnification and focal length. For trainees and supportive trainers with an invested interest, this low-cost model would provide a step-wise approach from latex gloves to chicken thighs to assisting in theatre. It allows trainees to learn the skill of triangulation albeit slightly differently from the operative microscope experience. It also allows the practice of cleaning the adventitia on chicken legs, suturing the back wall, and a transportable, interval-type training that aids muscle memory and should be transferable in the operating room.

Conflict of interest

We are currently conducting a survey among trainees on aids to assist in microsurgical training.

Ethics statement/confirmation of patients’ permission

None was required. No patient consent required.

Table 1
Features of different devices.

Features	Digital microscope	High ended camera phone	Surgical microscope
Cost	£40 (Average)	£900 (Average)	£800 (Used) Depending on requirements price range varies (>£2000)(New)
Zoom function	Excellent	Excellent	Excellent
Field of view	Adequate for microsurgery practice	Good	Excellent
Depth of focus	Shallow. Will require minor adjustment if objects move.	Good	Excellent
Space requirement	Minimal	Minimal	Minimum 200 cm × 200 cm × 200 cm space
Further accessories	None	Clip on holder	None

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