

# Laparoscopy in Developing Countries: A Resident-friendly Endo-Lap New Training Device

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## ABSTRACT

**Introduction:** Surgery via minimal access is the beauty of a surgical procedure. With minimal access, besides less pain and early return to activity for the patient, the surgeon also feels fulfilled. Minimal access surgery is currently gaining ground in developing countries. Training devices to achieve this especially for residents are not only scarce but expensive also in developing economies.

**Aim:** The aim of this study is to present a new resident-friendly training device for laparoscopy with the hope of improving residents' training in developing countries.

**Materials and methods:** A normal television monitor, camera, and bucket with cover is used to design an Endo-Lap trainer. Sigmoidoscopy and colonoscopy conduits are also incorporated in this device.

**Conclusion:** Surgery using minimal access technique can be aided with a training device made locally to achieve cost-effective and wider training benefits.

**Keywords:** Developing country, Endoscopy, Laparoscopy, Training device.

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**Conflict of interest:** None

## INTRODUCTION

Laparoscopic training is becoming part of surgical training in developing economies. It provides a safe means of acquiring fundamental skills. Laparoscopic trainers are useful aids in developing skills, such as hand-eye coordination, triangulation, depth-eye perception, and good ergonomics. Commercial laparoscopic trainers are expensive. Most trainees may not be able to afford them. Easy-made laparoscopic trainers have previously been described,<sup>1-3</sup> but these require the purchase of a webcam and the use of cables, and some iPhones are expensive. Hence, a very distinctive, laparoscopic trainer that can be

constructed using items readily available to the average surgical trainee at minimal cost is proposed.

## MATERIALS AND METHODS

A normal television monitor, camera, cables and bucket with cover, ordinary electrical bulb, foot pedal pump for insufflation are used to design an Endo-Lap trainer. Sigmoidoscopy and colonoscopy conduits are also incorporated in this device using plumbing conduit.

**Step 1:** Make multiple openings on bucket cover (Figs 1 and 2). Cut a hole for the camera holder and cable to pass from inside out of the bucket.

**Step 2:** Construct a cover to snug fit a camera (Sony was used in this design), connect the cable with AV output of monitor to Sony camera (Figs 3 to 8).

**Step 3:** Construct a light source with bulb (in this case energy bulb was used).



Fig. 1: Bucket with holes superior surface

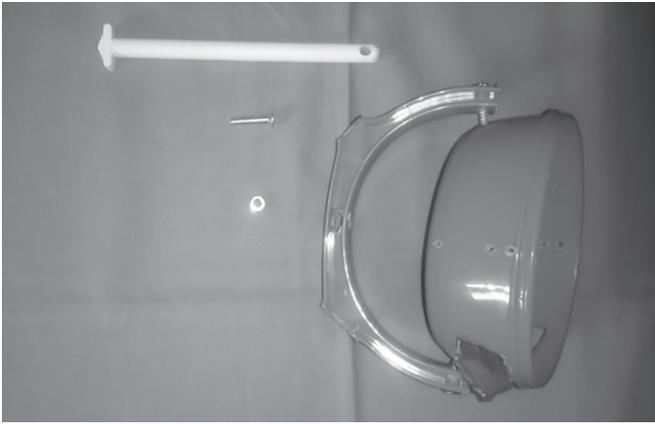


Fig. 2: Bucket side view

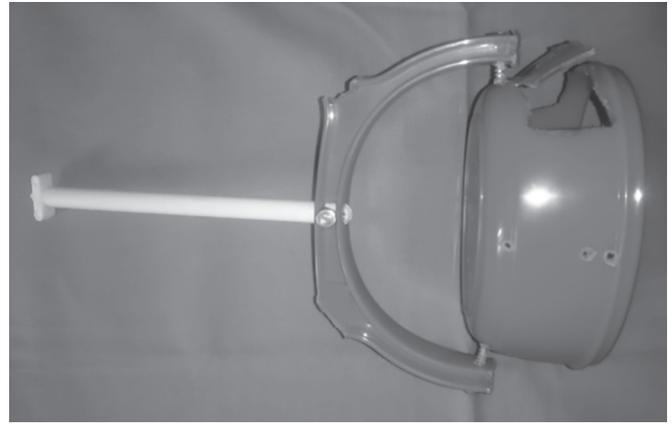
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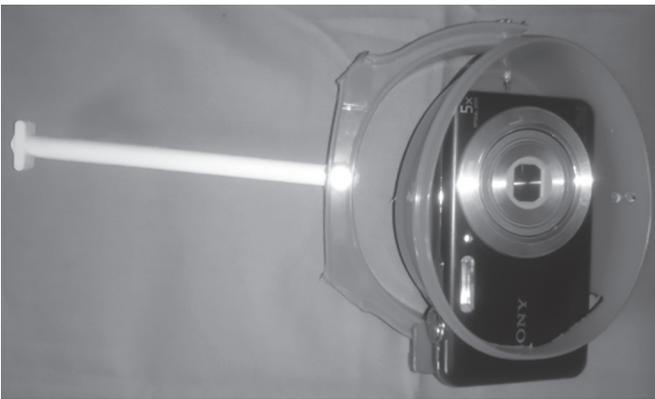
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**Fig. 3:** Camera holder uncoupled



**Fig. 4:** Camera holder coupled



**Fig. 5:** Camera fitted in holder



**Fig. 6:** Camera on while fitted in holder



**Fig. 7:** Monitor front



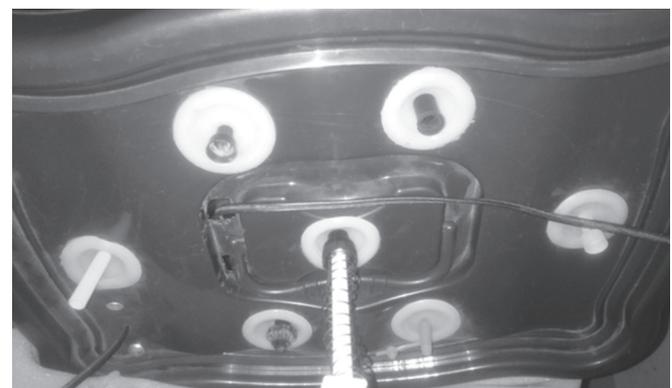
**Fig. 8:** Monitor back showing AV connection cable

Step 4: Simulate organs in the body (in this case, balloon, catheter, water conduit pipes were used). Connect conduit for endoscopy simulations.

Step 5: Obtain laparoscopic tools as usual for practice and the trainer is ready once connected (Figs 9 to 15). Foot pump is connected for insufflation (Fig. 12).

The interior part is shown, likewise the practice session views (Figs 16 to 18).

Many variations of the above can be constructed depending on the type of camera. Some have used smartphones, tablet computer, and software.<sup>3</sup> Additionally, a conventional laptop or desktop can be used in place of monitor. This design is unique.



**Fig. 9:** Bucket with cables (camera and light source) and camera control lever



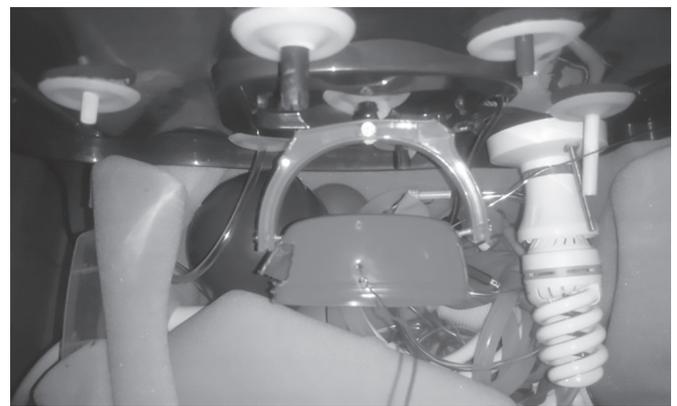
**Fig. 10:** Set-up



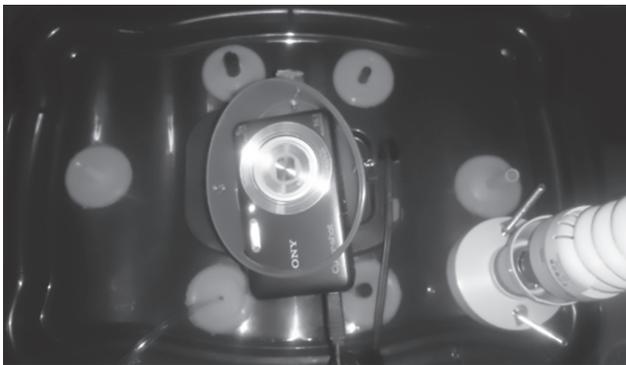
**Fig. 11:** Conduit connected



**Fig. 12:** Foot pump



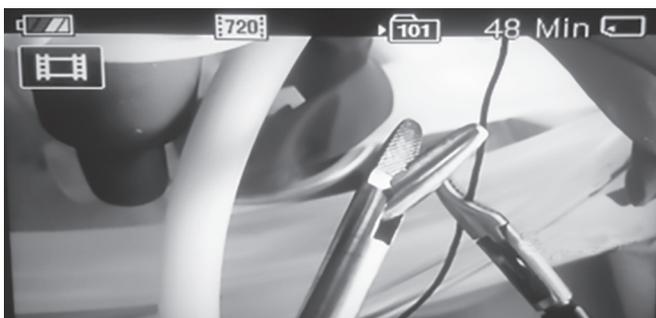
**Fig. 13:** Setup interior view



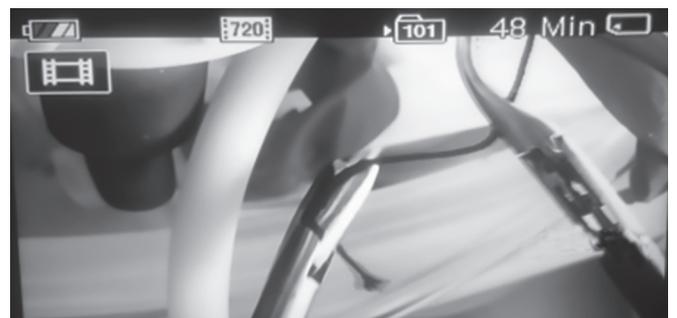
**Fig. 14:** Setup interior view with camera



**Fig. 15:** Setup interior view showing simulated organs



**Fig. 16:** View during practice about to knot



**Fig. 17:** View during practice knotting in progress



**Fig. 18:** View during practice with surgeon in action

Its distinct features are

- A good/high-definition camera
- Recorder component of camera
- Durable
- Cheap and easy to design

- Closed system for real-time simulation
- Organ simulations
- Endoscopy component.

### CONCLUSION

Surgery using minimal access technique can be aided with a training device made locally to achieve cost-effective and wider training benefits.

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