Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

A training tool to assess laparoscopic image navigation task performance in novice camera assistants

Mahbub Alam, MBBS, MSc,[a]
Michael S.J. Wilson, MBChB, BSc(Hons), MSc, FRCS,[b,*]
Benjie Tang, MBChB, MD,[a] *Iain S. Tait, MBChB, FRCS, PhD,*[b]
and Afshin Alijani, MBChB, FRCS, PhD[b]

[a] *Cuschieri Skills Centre, Dundee, UK*
[b] *Department of General Surgery, Ninewells Hospital & Medical School, Dundee, UK*

ARTICLE INFO

Article history:
Received 25 January 2017
Received in revised form
27 April 2017
Accepted 24 May 2017
Available online xxx

Keywords:
Proficiency-gain curve
Surgery
Laparoscopy
Training
Simulator
Camera assistant
Surgical education

ABSTRACT

Background: A number of tools for assessing task performance of the laparoscopic camera assistant have been described, but few focus on the acquisition and assessment of the attainment of proficiency in novice laparoscopic camera assistants. Our aim was to develop a simulated objective assessment tool for a novice camera assistant.

Materials and methods: A 10-cycle image navigation task tool was developed. This involved a series of 360° clockwise and anticlockwise rotation maneuvers of a 30° laparoscope along its shaft, focusing on a predefined geometric target on a 45° fixed slope in a laparoscopic box trainer. The tasks were to simultaneously maintain neutral horizon, optimum distance, and centering. Task accuracy and time to completion were assessed objectively at 3-s intervals on an unedited video recording.

Results: Twenty-nine novice medical students were assessed. Novices improved mean total error and task completion time (first *versus* fifth cycle, mean errors 15.4 *versus* 8.4, $P = 0.048$; mean task time 158.1 *versus* 92.9 s, $P = 0.04$). This improvement continued until the task cycle was completed (sixth *versus* 10th cycles, 7.9 *versus* 6.2, $P = 0.01$; 91.9 *versus* 76.6 s, $P < 0.0001$). There was a significant decrease in centering errors (5.2 *versus* 2.4, $P = 0.001$) and horizon (4.8 *versus* 2.3, $P = 0.004$), when comparing the first *versus* fifth task cycle. It took six cycles for optimum distance to achieve significance (5.4 *versus* 3.3, $P = 0.023$).

Conclusions: Using our assessment tool, novices achieved an objective proficiency-gain curve for laparoscopic camera navigation tasks. There was improvement in errors related to maintaining horizon, optimum distance, and centering. Mean task completion time also decreased. This tool could be used as an additional mean of assessment and training in novice surgical trainees.

This study has previously been presented orally at the Association of Surgeons of Great Britain and Ireland annual conference, Belfast, May 2016 with abstract published as follows: M Wilson, M Alam, B Tang, I Tait, A Alijani. A standardised tool to assess the proficiency-gain curve of a novice laparoscopic camera assistant. BJS 2016; S6: 87.

* *Corresponding author*. Department of General Surgery, Ninewells Hospital, Dundee DD1 9SY, UK. Tel.: 01382 660111x33890; fax: 01382 633994.

E-mail address: michaelwilson3@nhs.net (M.S.J. Wilson).

0022-4804/$ – see front matter © 2017 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jss.2017.05.096

Introduction

Great attention has been paid to the assessment of task performance and the attainment of surgical proficiency. Proficiency may be defined as the knowledge and ability to execute a procedure well.[1] The proficiency-gain (or learning) curve has been described for a variety of procedures and refers to the point at which a surgeon performs a procedure consistently well and with a good outcome.[2-4]

To date, little attention has been paid to the proficiency-gain curve of the laparoscopic camera assistant. In laparoscopic surgery, the ability to perform a procedure proficiently is dependent on the knowledge and skills of the surgeon, and the attainment of an optimal visual field to compensate for the loss of tactile feedback and depth perception compared with open surgery.[5] An adequate visual field requires an experienced camera assistant, and by deduction, there is also a proficiency-gain curve for the camera assistant. By convention, the role of the camera assistant falls to the most junior member of the team. Surgical trainees are expected to act as camera assistant with little prior knowledge or experience in this role. With such a pivotal role, the task of the camera assistant should not be underestimated.

Previous studies in this area have examined the use of both 0° and 30° laparoscopes and the use of simulated models *versus* box trainers in both simulated environments and in a real-life theater setting, using both novices and experts.[6-10]

Our aim was to develop a standardized laboratory-based training tool using a box trainer and study its effects on laparoscopic image navigation task performance in novice camera assistants.

Materials and methods

Twenty-nine medical students with no previous experience in laparoscopic surgery were recruited voluntarily and informed consent was obtained. Five experts (consultant surgeons with laparoscopic experience) undertook the same task for comparative purposes. Local ethical approval was granted. Participants watched an orienting 15-min audio-visual demonstration, with 5 min to familiarize themselves with the equipment before commencing the task.

The aim was to simultaneously maintain optimal distance, horizon, and centering of a laparoscopic image in a timely manner.

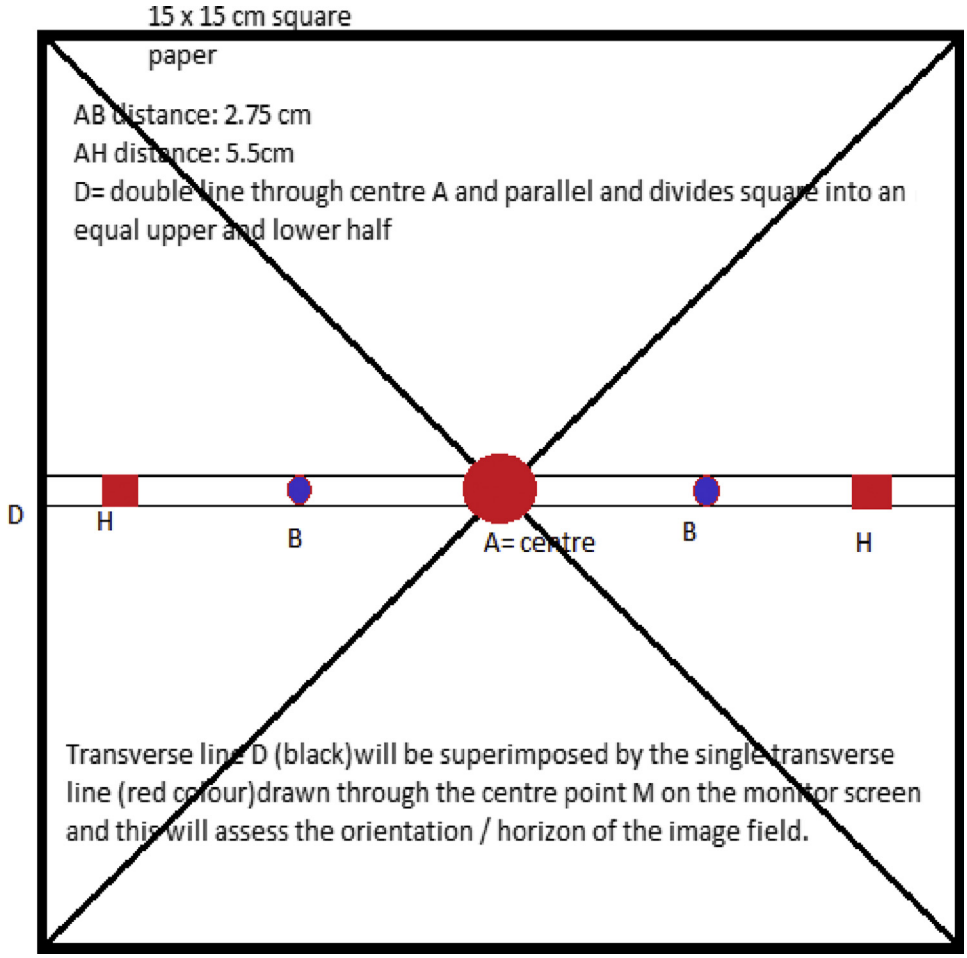

Fig. 1 – The target task design. (Color version of figure is available online.)