# Training for single port video assisted thoracoscopic surgery lung resections

## Philip J. McElnay<sup>1</sup>, Eric Lim<sup>2</sup>

<sup>1</sup>Department of Cardiothoracic Surgery, Newcastle University and Freeman Hospital, Newcastle upon Tyne, UK; <sup>2</sup>Department of Thoracic Surgery, Royal Brompton Hospital, London, UK

*Correspondence to*: Mr. Eric Lim. Imperial College and the Academic Division of Thoracic Surgery, Royal Brompton Hospital, Sydney Street, London SW3 6NP, UK. Email: e.lim@rbht.nhs.uk.

**Abstract:** With many surgical training programmes providing less time for training it can be challenging for trainees to acquire the necessary surgical skills to perform complex video assisted thoracoscopic surgery (VATS) lung resections. Indeed as the utilization of single port operations increases the need to approach the operating theatre with already-existing excellent hand-eye coordination skills increases. We suggest that there are a number of ways that trainees can begin to develop these necessary skills. Firstly, using computer games that involve changing horizons and orientations. Secondly, utilizing box-trainers to practice using the thoracoscopic instruments. Thirdly, learning how essential tools such as the stapler work. Trainees will then be able to progress to meaningfully assisting in theatre and indeed learning how to perform the operation themselves. At this stage is useful to observe expert surgeons whilst they operate—to watch both their technical and non-technical skills. Ultimately, surgery is a learned skill and requires implementation of these techniques over a sustained period of time.

Keywords: Video assisted thoracoscopic surgery (VATS); lung cancer; training

Submitted Oct 22, 2015. Accepted for publication Oct 22, 2015. doi: 10.3978/j.issn.2305-5839.2015.11.04 View this article at: http://dx.doi.org/10.3978/j.issn.2305-5839.2015.11.04

### **Training needs**

It is not unusual for surgical trainees to visit international units to learn new skills and techniques. In the United Kingdom, it is no different—there are a number of institutions that have visiting fellows and trainees and all are keen to learn from the senior clinicians in those units. One of the most common training needs cited by trainees is "to train in video assisted thoracoscopic surgery (VATS) lobectomy" and increasingly to, more specifically, train in single port VATS surgery, which is now used to perform lobectomies, segmentectomies and pneumonectomies as well as sleeve resections.

In the European, UK and possibly the rest of the world (maybe with the exception of the USA), the amount of operative surgical exposure time is simply insufficient (1) to "train" junior surgeons to become competent in VATS lung resections. The number of surgeons around the world performing VATS lobectomy also remains comparatively low, with the Society of Cardiothoracic Surgery in Great Britain and Ireland reporting only 30% of lobectomies performed by the minimally invasive approach in 2013-2014 (2). Willingness to train in general needs to be balanced against patient safety and care. Some training programmes offer more volume to junior surgeons if they use 3 or 4 ports to "share" the thorax and increase safety, but in single port surgery both share the same 3-4 cm incision. As a result, many junior surgeons pursue courses and observation periods in the expectation that they will be able to "learn" the technique.

However, with surgery requiring learned dexterity, observation alone may not impart the skills trainees require to progress in the technique. There are, however, a number of ways in which trainees can practice to allow development of those skills, and to become an excellent minimally invasive surgeon:

(I) Get an Xbox (or Playstation)

You need to be able to orientate in a 3D space whilst operating on a 2D (ideally HD) television. This

is a familiar skill to those who play video games. There have been numerous papers published suggesting that there is correlation between competence in minimally invasive surgery and the playing of video games (3,4). Whilst most of the studies relate to laparoscopic surgery the skills required in thoracoscopic surgery are very similar. The best games to learn how to orientate is first-person shoot 'em ups. Especially when situations involve the horizon changing from vertical to sideways, when "up" is left and "down" is right and so on. The ability to change your hand movements/ direction of surgery as the horizon tilts and change with the camera orientation is prerequisite. Without this skill you will always struggle in VATS surgery. Play regularly and enjoy it!

(II) Modular progression

For trainees who grew up in the 80s and 90s the concept of modular progression is not new. Computer games are built with this in mind. If, when you played a new computer games, you started at level 20 you would probably struggle, get frustrated and give up. However, when commencing at level 1 there is continuous development of new skills throughout the levels so that upon reaching level 20 the player doesn't feel frustrated.

The same thought process can be applied to surgery. By learning and practicing components of an operation in a sequential process it is much more stimulating and much less frustrating than diving in to the most complex steps. For junior trainees this might mean focusing on individual parts of the procedure such as inserting the port, closing the port, holding the camera, and firing the stapler on the lung. With each of these skills eventually becoming second nature a more senior trainee will feel much more comfortable in the operating theatre and be able to concentrate on learning how to perform each discrete operation.

(III) Get a real box, which becomes your play station

Practice (with your friends) using a camera in a box weekly, especially with more advanced cameras such as the Stortz Endochamelon where you can see the entire chest without moving the tip (extremely disorientating for newcomers). Buy a set of endoscopic instruments and practice exercises such as placement of rubber bands and small objects. If possible design a small obstacle course so you understand the importance of introducing angles to get to where you want from a fixed starting point (port site). Indeed there are often now departmental and hospital "box trainers" which makes the opportunity of training with these tools easier. Speak to your hospital training department early and arrange regular sessions.

Indeed "virtual reality" simulators are now available that allow trainees to practice the exact operation they wish to perform, such as a lobectomy (5). However, it is essential to first master basic skills such as orientation, instrument handling and depth perception and to be aware of the lack of tactile feedback from such simulators and the "forgiving" nature of the programming that allows the trainee much more leeway for errors than in real life.

(IV) Understand how a stapler works

Contact your friendly staple representative and ask him or her to talk you and colleagues through how their stapler works, how to use it correctly and what safety features they have when the staple malfunctions. VATS surgery can be tiring on one's mind when starting out you may have to focus on your hand-eye coordination until you are proficient. Simply knowing how the stapler works will not only help you to perform the operation safely, but it will also allow you to conserve your energy for more challenging parts of the procedure.

(V) Assist in operations

When you have the above skills (I-III) you will become a good assistant. Having an understanding of the operation and its steps will allow you to focus on being the best assistant possible. There are a myriad of ways in which you can do this-watch it on YouTube, read the steps in a book, discuss with the surgeon beforehand or use one of the many Apps available. You need to operate together with the surgeon (not simply hold the camera in a fixed view). It is apparent when trainees are looking at something else (the operating area of interest is not centered on screen) and that is incredibly annoying for the surgeon, and worse if the operating field is completely out of view (this happens when trainees take their eyes off the TV to look at or talk to the scrub nurse or when they are totally disorientated and cannot regain the line of sight), the latter reason implies that you need to go back to points I and II.

(VI) Perform the operation

If you are a good assistant that can operate together with the surgeon, you can start to train in VATS lung resections. The key throughout the "performing"

#### Annals of Translational Medicine, Vol 3, No 20 November 2015

stage is to remain open to learning. The experienced surgeon will have developed a highly tuned technique over a period of years. Even the smallest piece of advice (e.g., how to hold the instrument, which tissue plane to develop...) is often one that may make the operation significantly more achievable.

## (VII) See other surgeons

Now is the time you can visit and observe. You understand the technique; you know the moves and difficulties. Learning from other experts takes on a new meaningful level. When you observe, ensure you note how they position the patient, site the port, equipment used and placement, standing posture, arm movements and interaction with the team. Watching them perform the operation on the monitor alone is no better than watching it on YouTube—there is so much more happening in the operating theatre.

(VIII) Persevere

No one is born a talented surgeon; it is a reflection of the hard work and dedication (of which the majority happens outside the operating theatre)! Good luck.

#### Acknowledgements

None.

### Footnote

Conflicts of Interest: Dr. Lim reports personal fees from Abbott Molecular, personal fees from Glaxo Smith Kline,

**Cite this article as:** McElnay PJ, Lim E. Training for single port video assisted thoracoscopic surgery lung resections. Ann Transl Med 2015;3(20):319. doi: 10.3978/j.issn.2305-5839.2015.11.04

personal fees from Pfizer, personal fees from Norvatis, personal fees from Covidien, personal fees from Roche, personal fees from Lily Oncology, personal fees from Boehringer Ingelheim, personal fees from Medela, grants and personal fees from ScreenCell, personal fees from Ethicon, outside the submitted work; and He is the founder of Informative Genomics, a blood based molecular diagnostic company in London.

#### References

- 1. Maxwell AJ, Crocker M, Jones TL, et al. Implementation of the European Working Time Directive in neurosurgery reduces continuity of care and training opportunities. Acta Neurochir (Wien) 2010;152:1207-10.
- 2. Society of Cardiothoracic Surgery of Great Britain and Ireland, Thoracic Audit. Available online: http://www.scts. org/professionals/audit\_outcomes/thoracic.aspx
- Rosser JC Jr, Lynch PJ, Cuddihy L, et al. The impact of video games on training surgeons in the 21st century. Arch Surg 2007;142:181-6; discussion 186.
- Schlickum MK, Hedman L, Enochsson L, et al. Systematic video game training in surgical novices improves performance in virtual reality endoscopic surgical simulators: a prospective randomized study. World J Surg 2009;33:2360-7.
- Jensen K, Bjerrum F, Hansen HJ, et al. A new possibility in thoracoscopic virtual reality simulation training: development and testing of a novel virtual reality simulator for video-assisted thoracoscopic surgery lobectomy. Interact Cardiovasc Thorac Surg 2015;21:420-6.