Learning and Teaching Minimal Access Surgery. Living Through a Learning Curve

K. B. Galketiya

Department of Surgery, Faculty of Medicine, University of Peradeniya,
Sri Lanka

Correspondence: K. B. Galketiya
Professor of Surgery, Department of Surgery,
Faculty of Medicine, University of Peradeniya,
Sri Lanka
E mail: kbalketiya@yahoo.com
<https://orcid.org/0000-0002-7464-7371>

INTRODUCTION

Since the first reported cases of laparoscopic cholecystectomies in 1995 and 1996 there was a rapid rise of the procedure globally. Initially done mostly to perform cholecystectomy and appendicectomy, surgeons gradually used laparoscopy to perform surgeries of increasing complexity. Parallel to development of laparoscopy, other minimal access therapies like thoracoscopy, endotherapy, endovascular therapy and interventional radiology progressed.

The learning curve was challenging and the technique was viewed with suspicion by many in the early years, due to an increased incidence of complications such as bile duct injuries.

The main problems of acquiring the skill of laparoscopy were related to lack of tactile sensation, getting accustomed to a two dimensional image, difficulties of haemostasis, intra corporeal suturing, two hand dissection as opposed to dominant hand dissection of open surgery and a different dimension to hand-eye coordination.

Many surgeons well experienced in open surgery, mastered the skills of laparoscopy in a short period of time. Quite interestingly the surgeons who pioneered this procedure, were the 'older generation' who were skilled in a wide range of surgeries than the subspecialists.

Another problem, especially in developing countries like Sri Lanka, was the high initial costs to purchase laparoscopy systems and equipment including energy sources and stapling devices.

When I started as a surgical registrar in 1989 at the premier hospital of Sri Lanka, General hospital Colombo, there was no laparoscopy in our country. My training was under general surgeons and many

sub-speciality surgeons, with Professor A. H. Sherifdeen (FRCS, FRCSE) and Dr. Daya Rodrigo (FRCS) being my main supervisors. At that time we did not have any idea regarding the existence of laparoscopy, this being a time without internet facilities. In 1992/93, during my senior registrar period, Dr K L Fernando, a Sri Lankan surgeon who returned from the United Kingdom performed the first laparoscopic cholecystectomy in our country using his own equipment.

Currently, as a consultant attached to the Professorial Surgical unit of the University of Peradeniya, Sri Lanka, I perform a wide range of basic and complex laparoscopic and thoracoscopic surgeries.

This oration reviews the pathway of developing minimal access therapy in our country and my contribution and role in this endeavour.

METHOD

The development of laparoscopy in Sri Lanka included the following aspects.

1. Initial overseas training
2. Access to equipment
3. Starting of minimal access surgeries
4. Learning while performing surgeries
5. Training other categories of staff
6. Further overseas training
7. Support from the department of Anaesthesiology
8. Training surgical postgraduates
9. Research and publications
10. Collaborations with other countries

Overseas training

My initial exposure to laparoscopy was as at Westmead Hospital, NSW, Australia, a tertiary referral centre. I was a visiting fellow, for training to obtain board certification in Sri Lanka. My main supervisor was Professor John Fletcher (FRACS).

Laparoscopic cholecystectomy with per-operative cholangiography was well established at Westmead. During my one year I did not see any conversions or complications. I mainly assisted, which included camera operation and also performed one procedure. One of the surgeons performed complex operations, especially colorectal surgery, with success but taking long hours. I felt, complex operations by laparoscopy was perceived with less popularity. Therefore, complex operations with laparoscopy was not popular.

On my return to Sri Lanka I worked at two peripheral hospitals as a consultant till 1998. However, I could not perform laparoscopy due to the non availability of equipment. Shortage of general and sub-speciality surgeons required me to perform a wide range of surgeries, while handling a large volume of elective and emergency procedures.

The experience I acquired performing a wide range of routine and emergency surgery including vascular injuries, laid a solid foundation to my later conversion to the laparoscopic technique.

In 1998/99, I worked as a specialist registrar at Whittington hospital London, with two senior consultants of the hospital, Mr John Cochrane (FRCS) and Mr Russel Lock (FRCS). Upper gastrointestinal and colorectal surgery were their special interests, and both were general surgeons skilled in a wide range of surgical procedures. Under their supervision I assisted, performed with assistance and finally performed with supervision, many laparoscopic cholecystectomies.

Obtaining equipment

Returning to the peripheral hospital in Sri Lanka, I was delighted to see a laparoscopy unit in the hospital, received as a donation to perform female sterilizations. I purchased equipment required for laparoscopic cholecystectomies through a local organization supporting the hospital.

In the year 2000 I performed the first laparoscopic cholecystectomy reported outside of the country's capital city. I had to train all categories of staff as none had seen this procedure before. I started

laparoscopic appendicectomies as well. Endoloops being unavailable, the appendix was exteriorized via a 10mm port at the right iliac fossa after dividing the meso-appendix, to ligate and divide the appendix base extra-corporeally. I did mobilizations of colon to a certain extent and proceeded with open resection. I realised that laparoscopic colonic surgery would be feasible one day.

Learning while performing surgery

I attended a live laparoscopic surgery workshop by Professor C. Palanivelu, at the Sri Jayawardenepura Hospital, Sri Lanka in 2001. He performed many procedures including laparoscopic cholecystectomy, appendicectomy and hernia surgery. A demonstration on using the ultra-sonic dissector of Ethicon (Harmonic scalpel) was performed. Following the work shop I obtained videos of the procedures and watched them frequently.

In 2001 I was appointed to the Teaching Hospital Karapitiya, affiliated to the University of Ruhuna. Being a tertiary care hospital there were seven general surgeons as compared to two in the periphery. Sub-specialities of genito-urinary, orthopaedic, neuro, cardiothoracic and paediatric surgery were available as compared to none at my previous stations. The casualty workload was very much less. The range of routine work too decreased.

Reduction of the workload afforded me the opportunity to develop a special interest. I decided on minimal access surgery which was in its infancy in our country. I began routine vascular surgery as well, based on my former training in Sri Lanka, Australia and the UK. The vascular work made me confident in my other major open surgical procedures as well as laparoscopy

At the new institute I had more operating theatre time for laparoscopy. While continuing with cholecystectomy and appendicectomy, I mobilised the colon and also attempted splenic mobilizations with increasing success. After mobilizing to a certain extent, I continued with laparotomy. At each instance, my thoughts were on how to improve further. In 2003, an abdomino-perineal resection was performed totally by laparoscopy. I had to go a longer length perineally than usual, which made me realise that more laparoscopic mobilization was required.

In 2003 I was awarded a fellowship from the College of surgeons of Sri Lanka, enabling me to visit two hospitals in India for a period of six weeks. I observed laparoscopy and participated in a workshop.

I observed that most hospitals were trying to develop laparoscopy skills while a few outstanding places like the Gem hospital of Professor Palanivelu set a model to follow. During this stay I purchased an atlas of laparoscopic and thoracoscopic procedures by Prof Palanivelu. This was the main guide for my further progress and we performed a pancreatic pseudo-cyst drainage in 2005. (1,2)

Returning to Sri Lanka, I proposed a structured training program to the College of Surgeons of Sri Lanka, on training of surgical post-graduates in laparoscopy.

I proposed the following

1. Workshops
2. Training on a lap trainer
3. Watch videos
4. Assist
5. Perform with assistance
6. Perform under supervision

Working on the proposal, I established the first laparoscopic training unit of our country at my hospital (Figure 1)

Figure 1: Minimal access training unit at Teaching Hospital Karapitiya

The Post graduate institute of medicine provided me with funds to purchase a trainer for 50,000 Sri Lankan rupees. Later one of my house officers made me one just for 2000 rupees. We developed this in the abdomen of a plastic dummy discarded from a textile shop. The Professor of anatomy at the allied faculty developed model organs to fill the abdomen (Figure 2).

Figure 2: Model of abdomen

For each practice session a gall bladder with a cystic artery and duct were attached to the liver bed using a balloon and two short saline tubes (Figure 3).

Figure 3: Gall bladder model

Suturing practice was done on the commercially purchased trainer with the standard empty box. I regularly practiced suturing as the unit was at the theatre complex. Later Ethicon donated us another trainer. I had a collection of videos in the unit including a few by Professor Alfred Cusheri on various laparoscopic skills. Regular workshops for trainees and nursing staff were organised and targets were set for trainees to achieve.

Post Congress Workshops Galle Medical Association – Annual Academic Sessions 2006		
Vascular Surgery Workshop Dates: 17 th & 18 th September 2006 (Sunday & Monday) Time: 9.00 am – 4.00 pm Venue: GMA Lecture Theatre Resource Personnel Prof. Mandika Wijeyaratne MS, FRCS Dr. K.B. Galketiya MS, FRCS Dr. A.F. Fathiehu MD Dr. M.B. Samarawickrama MS <i>Organised by</i> Galle Medical Association, College of Surgeons of Sri Lanka and Vascular & Endovascular Society of Sri Lanka 20 participants only Course Fee – Rs. 400/-	Basic Laparoscopy Workshop Dates: 19 th & 20 th September 2006 (Tuesday & Wednesday) Time: 9.00 am – 4.00 pm Venue: GMA Lecture Theatre & Laparoscopy Training Unit, T.H. Karapitiya Resource Personnel • Dr. Sumudu Kumarage MS, FRCS • Dr. K.B. Galketiya MS, FRCS • Dr. Hasanjaya Gunawardhana MS, FRCS <i>Organised by</i> Galle Medical Association and College of Surgeons of Sri Lanka 20 participants only Course Fee – Rs. 400/-	Live Laparoscopy Workshop (Transmission to GMA Lecture Theatre from Operation Theatre C) • Splenectomy • Hysterectomy • TEP (Hernia repair) • Cholecystectomy • Appendicectomy Dates: 26 th September 2006 (Tuesday) <i>Organised by Galle Medical Association</i> Course Fee: Consultants - Rs. 1000/- Trainees - Rs. 250/-

Figure 4: Programme of laparoscopic workshop held

To facilitate live surgery workshops a link was developed from the operating theatre and endoscopy unit to the Galle medical association (GMA) lecture theatre (Figure 5).

the British High Commission after submitting an extensive audit of the services provided.

This table shows contents of the audit provided (Table 1)

Figure 5: Live transmission facility

A training in advanced laparoscopic surgeries at Eusculap academy, Germany, provided me with further insight.

We were given a harmonic scalpel by the Ministry of Health. Using this and a bipolar diathermy I purchased from India, we successfully performed funduplications, Heller's cardiomyotomy, splenectomy and bowel resections laparoscopically. We succeeded in obtaining a new laparoscopy unit with better image quality, through a donation from

Table 1: Contents of audit

- Introduction regarding minimal access surgery
- Outline of current services-clinics, in-patient facilities, paraclinical services, operating theatre facilities
- Number of laparoscopic surgeries performed
- Number of open surgeries performed which have the potential to be done by laparoscopy
- Outline of available setup and limitations including optics, gas insufflation etc
- Details of surgical postgraduates and medical undergraduates being trained
- Details of possible research in future
- Audit of workshops being held

Doing open oesophagectomy, I felt mobilizing the thoracic oesophagus would be easier than mobilizing an abdominal organ. With the new unit we performed the first thoraco-laparoscopic oesophagectomy in Sri Lanka, in 2004. Thoracoscopy was done without standard double lumen intubation and lung collapse. Instead, we used single lumen intubation and obtained a partial lung collapse with a capnothorax.

A semi prone position was used instead of the standard full prone position (Figure 6)[4,11,13,14,16,18].

Figure 6: Semi prone position

In 2007 I joined the Faculty of Medicine Peradeniya as a senior lecturer. For continued learning I participated in live surgery workshops in India.

We started laparoscopic adrenalectomies which during the past I had performed by open surgery [3]. With experience in laparoscopy and open surgery, the change to laparoscopy was easy. I had the opportunity to work with a senior surgeon of our country, Professor C Ratnatunga, at Peradeniya. He was experienced in open thoracic surgery.

Through thoracoscopic oesophagectomy I was familiar with intrathoracic anatomy. With this hybrid experience of open thoracic surgery and minimal access surgery, the following thoracoscopic procedures were established (Table 2) [6,9,10,12,15].

Table 2: Thoracoscopic procedures

Procedure	Number
1. Thoracoscopic mobilization of oesophagus	44
2. Transhiatal mobilization of oesophagus	10
3. Lymph node biopsy	8
4. Lung biopsy	15
5. Sympathectomy-Thoracic 2 nd to 4 th	12
6. Sympathectomy for cardiac denervation- Lower half of Stellate ganglion along with thoracic 2 nd to 4 th	2
7. Splanchnicectomy	24
8. Thymectomy	32
9. Excision of retrosternal goitre	2

All these procedures were done with intubation using a single lumen endo tracheal tube. The partial lung collapse achieved by capnothorax provide adequate space to operate (Figure 7).

Figure 7: Display of lung collapse

Having experience in many major procedures our focus was placed on performing complex hepatobiliary procedures. These were done by open surgery for many years in our unit. Prior to embarking on this endeavour, I had a re-exposure by attending live surgery workshops in India and frequent video observations.

We succeeded in performing the following procedures (Table 3) [1,8,17,19,20]

Table 3: Laparoscopic HPB procedures

Procedure	Number
1. Excision of choledochal cyst with Roux-en-Y reconstruction	4
2. Laparoscopic assisted pancreaticoduodenectomy (Whipples procedure)	24
3. Laparoscopic distal pancreatectomy	6

Perfecting the laparoscopic Whipples procedure was a sequential pathway with conversion to open surgery at various stages in the early days.

We recently performed an excision of a Klatskin tumour and Roux-n-Y reconstruction laparoscopically, the first reported case in Sri Lanka.

I am grateful for the support extended to me by the entire surgical team, in the establishment and evolution of all laparoscopic surgeries performed.

Collaboration with the Department of Anaesthesiology

The strong commitment and support of the Department of Anaesthesiology was a key to success. Laparoscopy and thoracoscopy with long operating

hours posed new problems to anaesthesiologists. The support from consultant anaesthetists Professor Vasanthi Pinto (MD, FFARCS) and Dr Rochana Perera (MD, FFARCS), and their anaesthetic teams along with honorary consultant Professor Lakshman Karaliedde (FFARCS), played a major role in paving the way for successful complex laparoscopic surgery. Professor Vasanthi Pinto made many contributions to research resulting in many publications and two orations.

Contribution to research

We have many publications in national and international journals. I have delivered two orations based on minimal access surgery.

I co-supervised a PhD student who performed chemical analysis of Gall stones retrieved via laparoscopic cholecystectomies. This project produced many publications [21,22,23].

Contribution for training

I have trained surgical postgraduates, over 150 registrars and over 50 senior registrars, since the year 2000.

I coordinate an annual live Hepato-Biliary workshop with a visiting team from Australia since 2014. This is as a pre congress workshop at the Joint annual sessions of the College of Surgeons of Sri Lanka, Royal College of Surgeons of Edinburgh and SAARC surgical care society (Figure 8).

Figure 8: Surgical skills workshop 7

Since 2017 I coordinate a skills course conducted by the Association of minimal access surgeons of India (AMASI)(Figure 9).

Figure 9: AMASI skills course

I am an invited faculty member of the annual congress of the association of minimal access surgeons of India. I have been conferred the title 'Honorary Fellow of the Association of Minimal Access Surgeons of India.

DISCUSSION

Minimal access surgery has gained popularity because of reduced morbidity. Clarity of the picture obtained through magnification and close zooming allows a technically better quality of surgery with reduced blood loss.

It is the gold standard for many procedures like cholecystectomy, appendicectomy and diagnostic procedures. With complex procedures, challenges like steep learning curves, difficulties of haemostasis, and prolonged operating times are observed. Anaesthesiologists face problems not encountered in open surgery. Therefore, a strong collaboration is required.

During the learning curve, experience in open surgery facilitates change over to laparoscopy. It may be sequential learning with planned conversions at the beginning. Once the technique is established in a unit, taking it forward is easy. However, juniors starting laparoscopy in an established unit should remember the importance of being skilled in open surgery.

For sub speciality units it may be easier as a selected few procedure are done in large numbers.

The commitment all surgeons have with regards to training postgraduates should be kept in mind. A structured training program with regular reviews are important. Workshops, watching videos and working on lap-trainers are important. But the

most important is assisting and performing with assistance. It is important for trainees to perform above a minimum number of cases, set for each type of surgery. There are centres considering the feasibility of cadaveric training.

CONCLUSIONS

Experience in open surgery, acquiring laparoscopy skills and patient safety are key factors to be successful in minimal access surgery. Observing the work of experts and practice on trainers are useful adjuncts

REFERENCES

1. Paranaidana R, Galketiya KB. Laparoscopic treatment of a pancreatic pseudocyst. *Galle Medical Journal*, 2005;10(1):40-41.
2. Galketiya KB, Edirimuni SS. Laparoscopic case series. *Galle Medical Journal*, 2007;12(1):59-60.
3. Galketiya KB, Pinto V. Laparoscopic excision of left phaeochromocytoma *Galle Medical Journal* 2009;14(1):66
4. Galketiya KB, Wickramanayake AB. Minimal access to the mediastinum; assessment of camera port placement and patient positioning. *Galle medical Journal* 2009;14(1):107
5. Galketiya KB, Pinto V, Perera R, Jayasooriya U, Rohankumar R, Gamage DSB, Weerasinghe WNL. The role of laparoscopy in vascular surgery: our experience. *The Sri Lanka Journal of Surgery* 2013;31(3):61-63
6. Galketiya KB, Pinto V, Peiris SPM, Jayasoriya JADU. Solangaarachchi SAC. Thoracoscopy assisted total thyroidectomy for retrosternal goiter. *The Sri Lanka Journal of Surgery* 2013; 31(2):25-26
7. Galketiya KB, Lamawansa MD, Pinto V, Kumarasingha N. Laparoscopic Cholecystectomy for a left sided Gall Bladder in a patient with situs inversus totalis. *Sri Lanka Journal of surgery* 2013(22):1:24-26
8. Galketiya KB, Pinto V, Rathnatunga N, Wanasinghe WMMPB, Peiris SPM. Laparoscopic distal pancreatectomy: A Sri Lankan experience. *The Sri Lanka Journal of Surgery* 2013; 31(1):22-23
9. Galketiya KB, Pinto V. Thoracoscopic sympathectomy; evaluation of technique and advantages. *Journal of the Ceylon College of Physicians*, 2013;44: 45-46
10. Galketiya KB, Pinto V, Perera R, Wijeweera I, Medagedara D. The future of thymectomy; Gateway and beyond. *Sri Lanka Journal of Medicine* 2013;22(1):3-7
11. Galketiya KB, Pinto V. Port placement in thoracoscopy. *Anuradhapura Medical Journal* 2014;08(01):9-20
12. Pinto V, Galketiya K, Gamage D, Wijesinghe D. Endoscopic Thoracic Sympathectomy (ETS) for Complex Regional Pain Syndrome (CRPS). *Sri Lankan Journal of Anaesthesiology* 2014;22(1):29-31
13. Pinto V, Galketiya KB. Insufflation pressure required for thoracoscopic surgery and its influence on respiratory and cardiovascular parameters. *Sri Lankan Journal of Anaesthesiology* 2014;22(2):55-58
14. Galketiya KB, Pinto V, Bandara SM. Thoracoscopy: beyond the key hole. *The Sri Lanka Journal of Surgery* 2014;32(1):29-34.
15. Galketiya KB, Pinto V, Bandara WRS. Use of Thoracoscopic Splanchnicectomy for the Relief of Chronic Pancreatic Pain: a Case Series. *International Medical Journal Malaysia* 2014;13(2):45-47
16. Galketiya KB, Pinto V. A new approach for thoracoscopic posterior mediastinal procedures. *Ruhuna Journal of Science* 2014;(5):10-20
17. Galketiya KB, Pinto V, Perera R, Rohankumar R, Jayasooriya U, Gamage DSB, Aluwihare S. Laparoscopic excision of choledochal cyst. *The Sri Lanka Journal of Surgery* 2014;32(3):50-52
18. Galketiya KB, Pinto V. The use of intercostals drainage following thoracoscopic lymph node biopsy. *The Sri Lanka Journal of Surgery* 2014;32(4):19-21
19. Galketiya KB, Pinto V, Chathuranga VGK, Hemachandra H, Rajapaksha C, Aththnayake D. Laparoscopic liver resection as a treatment modality for hepatic secondaries in a patient with cervical carcinoma. *Journal of the Postgraduate Institute of Medicine, University of Colombo, Sri Lanka* 2014;1(1):1-3
20. Galketiya KB, Pinto V, Samarasinghe B, Rohankumar R, Bandara W. Management of Pancreatic Pseudocyst: Where do we stand? *Anuradhapura Medical Journal* 2015;9(1)
21. Weerakoon HTW, Ranasingha JGS, Galketiya KB. Can the type of gall stones be predicted with known possible risk factors, a comparison between mixed cholesterol stones and black pigment stones *BMC gastroenterology* 2014;14:88
22. Weerakoon HTW, Ranasingha JGS, Galketiya KB. Serum lipid concentrations in patients with cholesterol and pigment gall stones *BMC gastroenterology* 2014;7:548
23. Weerakoon HTW, Ranasingha JGS, Galketiya KB. Chemical characterization of gall stones, an approach to explore the aetiopathogenesis of gall stone disease in Sri Lanka *PLOS* 2015 DOI:10.1371