Chapter 2
How to Improve Your Laparoscopic Skills Quickly

Mahesh R. Desai and Arvind Prakash Ganpule

Abstract An ideal learning curve ascends through laboratory training, attending structured instructional courses, performing surgeries under supervision of a qualified mentor, followed by performance of cases which are properly selected. Various pelvic trainers such as mechanical trainer, hybrid trainer, and virtual reality trainer in the skills laboratory do help the novices to acquire the basic laparoscopic skills and the video eye-hand coordination. Specialized models for individual procedures (urethrovesical anastomosis, donor nephrectomy, pyeloplasty, etc.) can be easily devised, and boost the trainee's confidence and help in troubleshooting just prior to the procedure. Mentoring is a key component of any laparoscopic training program. A trainee can be mentored in ways of instructional courses, videotape, mutual mentoring, supervised clinical training, telesurgical mentoring, and proper case selection; nevertheless, the obstacles with mentoring lie in commitment from both the trainee and the mentoring surgeon.

Keywords Laparoscopy • Learning curve • Mentor • Training

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2.1 Introduction

The model "see one, do one, and teach one" does not apply to laparoscopy because of the spatial orientation which needs to be developed in a two-dimensional environment and need for dissection with longer instruments. The inherent learning curve that one has to overcome has been quite convincingly noted in a series wherein there was a decrease in the complication rate from 13.3% to 3% after the first 100 cases [1].The need for overcoming this steep learning curve "quickly" warrants a structured mentored approach for training in laparoscopy.

The training in laparoscopy, to blunt the learning curve, typically involves graded learning curve. An ideal learning curve ascends through laboratory training, attending structured instructional courses, performing surgeries under supervision of a qualified mentor, followed by performance of cases which are properly selected.

The key question we will address in this chapter is how an uninitiated "novice" can start doing laparoscopy quickly for urologic indications.

The pillars for proper laparoscopy training are:

(a) Skills laboratory training
    (i) Pelvitrainer or box trainer training
    (ii) Animal model skill acquisition
(b) Mentor supervised clinical training
(c) Case selection in initial cases

2.2 Skills Laboratory Training

Training in skills laboratory is an initial step in training in laparoscopy. The skills laboratory (pelvitrainer and animal models) helps the individual to acquire the necessary hand-eye coordination and adaptation to 3D vision. The various pelvitrainers that are available are [2]:

2.2.1 Mechanical Trainers

On these models the trainees can learn adaptation to restrictive freedom of movement and reduced haptic feedback. They also help in learning the nuances of handling a laparoscope and trocar placement. Basic steps such as dissection, clipping, and cutting can be practiced. These models are comparatively cheap (Fig. 2.1).

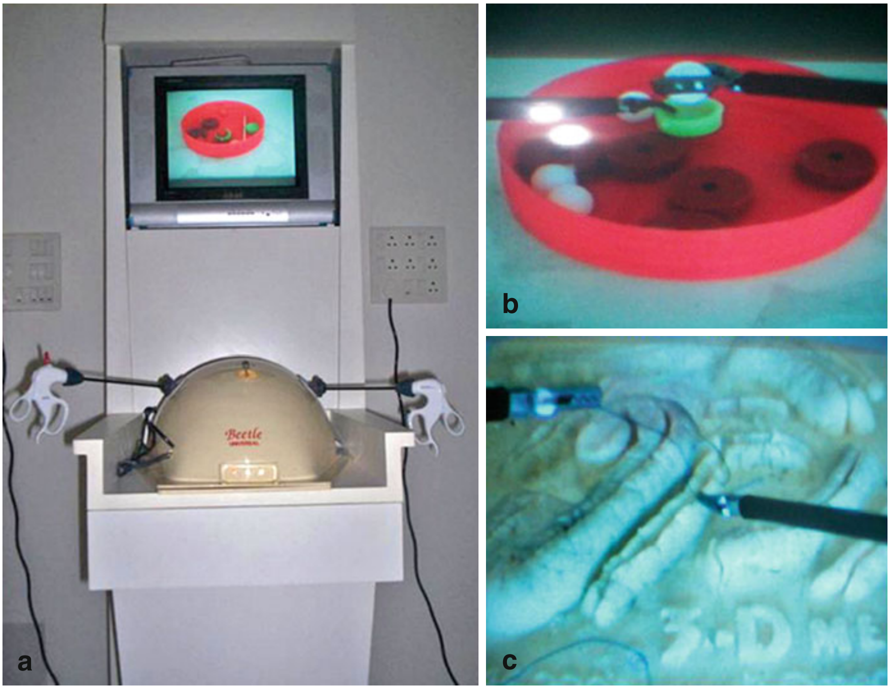


Fig. 2.1 Skills laboratory training on pelvitrainer. (**a**) Simulator for laparoscopy. (**b**) Skills laboratory exercises. (**c**) Knot tying skills on rubber pad

2.2.2 Hybrid Trainers

They are similar to mechanical trainers except they receive inputs from a computer. The trainer also gets a tactile feedback.

2.2.3 Virtual Reality

These have the capability to manipulate the images and receive a feedback. For beginners the mechanical trainers are the best as they are cheap and can be easily assembled. The trainers can be assembled with the following components, namely, webcam, cardboard box, and desk lamp. The trainee can cut out a task for himself and can score himself on a scorecard.

Standardized programs can be used to assess the baseline laparoscopic skills and track the trainee's progress. The McGill inanimate system for training and evaluation of laparoscopic skills (MISTELS) [3] consists of peg transfer, pattern cutting, ligating loops, and suturing with knots. All these can be performed on an endotrainer box.

2.3 Homemade Endotrainer Box

Beatty et al. have described a laparoscopic trainer which can be assembled with a meager cost of 50 GBP [4]. The assembly requires a computer with free USB port, a webcamera, a clear translucent plastic box (30 × 20 cm in size), few reusable adhesives, building brick, a 5-mm drill, and laparoscopic instruments. The advantages of using a webcam are that it will act as a “cybercamera man” and has the ability to zoom or defocus. The advantage of such webcam-based cheap trainers is that it can be used by trainees and obviate the need to travel to centers having sophisticated pelvitrainer. This will save time and money for the trainee.

The tasks that the trainee can perform are bead transfers, sewing beads on a toothpick, and glove exercises such as cutting and suturing (interrupted and continuous on a rubber mattress) (Fig. 2.1).

A variety of models for individual procedures have been described. A brief outline of a few important ones is given. Most of these models can be easily prepared and practiced just prior to the procedure. The trainee can practice on this model just prior to the case which will boost his confidence and help in troubleshooting.

2.3.1 Model for Urethrovesical Anastomosis

Two 10-cm segments of pigs’ intestine are used to create the model. One segment of the pig’s intestine is placed over a syringe and secured to the syringe with 2-0 silk. This represented the bladder portion. The urethral portion is created by placing the other segment of pig intestine over a 15-ml centrifuge tube; this represents the bladder. The whole assembly is kept in a box trainer. Once the anastomosis is completed by the trainee, it can be tested by injecting water with a syringe. A Petri dish below the neoanastomosis quantified the leakage. A study by Boon et al. on this model suggested that test of performance time and postoperative leakage accurately reflected the experience of the surgeon [5]. Similarly, Laguna et al. [6] have shown the construct validity of chicken model in simulation of laparoscopic radical prostatectomy suture. In this study, after partially emptying the abdominal cavity of a cadaveric chicken, the esophagus was intubated with 18 Fr catheter, and the model was placed in a laparoscopic pelvitrainer. The urethrovesical anastomosis can be practiced on this model (Fig. 2.2).

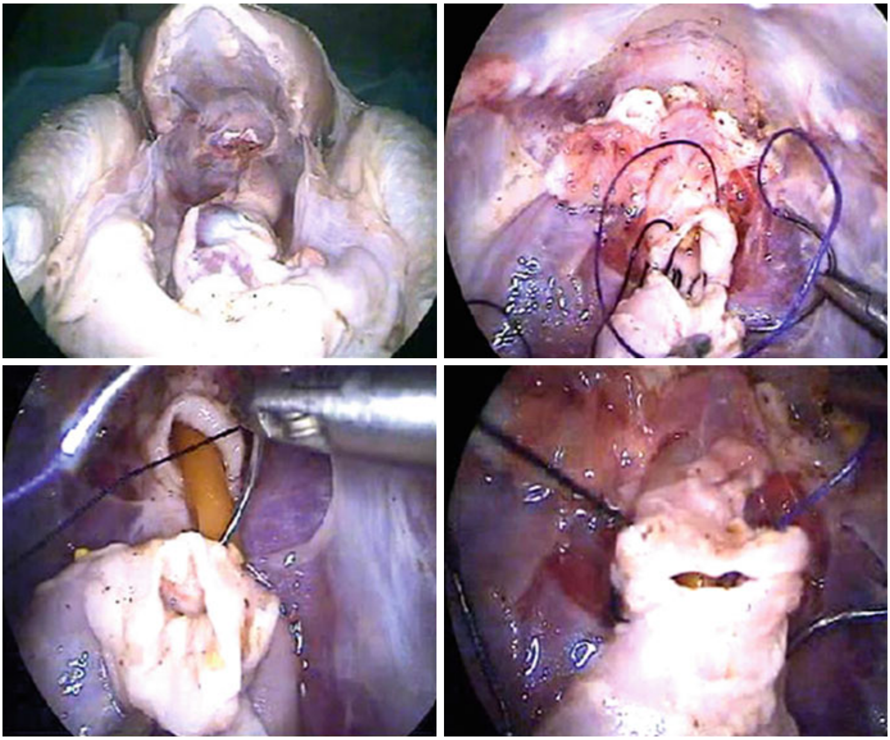


Fig. 2.2 Urethrovesical anastomosis on cadaveric chicken model

2.3.2 Donor Nephrectomy

In a training model by Cavallari et al., the workers performed hand-assisted donor nephrectomy (HALDN) in 10 pigs [7]. They concluded that in vivo training models make it possible to reproduce the positions and operative difficulties encountered in clinical practice. They conclude that this model is a high-fidelity model training procedure that was useful and convenient to achieve skills for HALDN.

2.3.2.1 Laparoscopic Pyeloplasty

Ramchandran and coworkers [8] have devised a model from crop and esophagus of a chicken cadaver (Fig. 2.3). The assembly was placed in a laparoscopic training box. An assessment was done as regards the time required to complete the anastomosis and quality of anastomosis. All the trainees could complete the anastomosis, and there was a significant improvement after the 4th attempt.

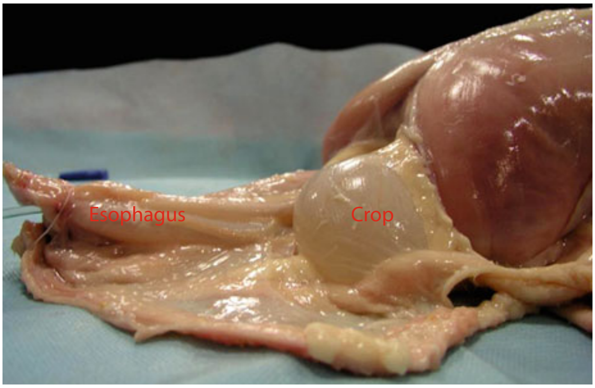


Fig. 2.3 Chicken crop model for learning pyeloplasty

McDougall [9] described a porcine model for training in laparoscopic pyeloplasty. In this model a secondary ureteropelvic junction obstruction was created after ligating the ureter, and after 6 weeks, the enlarged pelvis was suitable for training.

2.4 Mentoring

Mentoring is a key component of any laparoscopic training program. There have been extensive data regarding the usefulness of such training in developing laparoscopic skills. The obstacles with mentoring include commitment from both the trainee and the mentoring surgeon. A trainee can be mentored in the following ways:

2.4.1 Didactic Lectures and Instructional Courses

After attaining basic laparoscopy skills, a brief mentor program simultaneously is advocated to successfully launch the laparoscopic efficiency. There are mini fellowships or a dedicated 2-year endourology or Society of Urologic Oncology fellowship program. The didactic lectures and courses help the trainee to have one-on-one interaction with the trainers and learn the theoretical aspect of the disease and treatment before its application.

2.4.2 Videotape Mentoring

Nakada et al. [10] described the concept of videotape mentoring in teaching advanced laparoscopic techniques. This group of workers demonstrated that videotape critiquing and analysis were beneficial. The uninitiated may benefit by repeatedly viewing the videotapes of operations performed by him or one of his colleagues. A further step in this direction would be reviewing videos of initial cases by the trainee himself. The trainee can identify the pitfalls and the troubleshooting in the cases and improve on them.

2.4.3 Mutual Mentoring

This concept was brought out by Jones and Sullivan [11]. These two authors simultaneously were fellowship trained and performed procedures jointly. The advantage of this procedure as noted by them includes expert camera assistance, a "second opinion" during surgery. This approach benefits two novices at the same time. This approach has the potential to benefit both the parties although it may be geographically restrictive and time-consuming.

2.4.4 Mentored Supervised Clinical Training

This generally is the training in the last stage. The mentored supervised clinical training is also preferably structured. In the initial stage the trainees act as camera driver. This helps in understanding the laparoscopic anatomy and the ergonomics of laparoscopic instrument use. The next step would be performing simple operations such as renal cyst marsupialization, laparoscopic ureterolithotomy, or laparoscopic orchidopexy. All these procedures should be performed under the mentorship of an experienced laparoscopic surgeon.

The mentor should have a keen sense of responsibility and patience for teaching. The mentor gives guidance regarding the anatomic landmarks such as the psoas muscle, aorta and the inferior vena cava, the renal vein, adrenal gland, and the vessels [12, 13]. In pelvic surgeries he also guides regarding the dissection of the space of Retzius.

The mentor can also guide the trainee regarding the tricks of applying a variety of clips and the troubleshooting guidelines in the event of a problem. Such training programs have been developed to develop skills in laparoscopic pyeloplasty and laparoscopic adrenalectomy. The mentored training should be structured for each procedure. The procedure should be divided in steps, and the mentor should take over the case if he feels the case is not progressing or the trainee is not able to handle it. The example of how a procedure for the purpose of mentoring can be divided according to steps is given below:

Laparoscopic Pyeloplasty

1. Trocar placement and dissection of the retroperitoneal space
2. Gerota's fascia incision and mobilization of dilated renal pelvis and upper ureter

3. Trimming of renal pelvis and ureter
4. Corner stitch and excising the stenotic segment with the redundant pelvis
5. Stent insertion and anterior ureteropelvic anastomosis

Laparoscopic Nephrectomy

1. Trocar placement and reflection of the colon
2. Dissection and lifting of the ureterogonadal packet
3. Identification and dissection of the vessels
4. Securing the vessels
5. Dissection of the upper pole
6. Retrieval of the specimen by entrapment in the bag

2.4.5 Telepresence Mentoring

Telesurgical mentoring is an evolving offshoot of telemedicine. This concept involves an experienced surgeon assisting or directing another less experienced surgeon who is operating at a distance [14]. Setup includes real-time transmission of audio and operative images to a central "telesurgical mentor" assisted by 2-way intraoperative interaction. The mentor can guide and teach practicing surgeons new operative techniques utilizing dedicated computer-based image and audio transfer system. This is believed to enhance surgeon's education and decrease the likelihood of complications due to inexperience with new surgical techniques. The goal of this application of telemedicine is to improve surgical education and training for complex laparoscopic urological procedures, with an ultimate aim to improve health-care delivery by widespread availability of urologic surgical expertise. Eventually, surgical telementoring could assist in the provision of surgical training to trainee surgeons with limited experience. It allows novice surgeons with limited formal advanced laparoscopic urologic training to benefit from expert intraoperative advice, simultaneously allaying performance anxiety arising from constant presence of expert surgeon in the vicinity. At the same time, it appears to assist in independent decision making, increasing confidence of operating surgeon, expert help being available as and when needed.

Disadvantages are: requirement of constant involvement of instructor surgeon, and secondly, the telementoring of surgical procedures is currently achieved via a wired infrastructure that usually requires sophisticated videoconference systems along with trained and dedicated IT personnel for troubleshooting and maintenance.

2.4.6 Case Selection

Proper case selection is "key" to success of a laparoscopic surgeon in the initial part of the learning curve (Fig. 2.4). In the initial cases, one should do an axial imaging prior to the procedure; this helps to assess the vascular anatomy as well as helps the

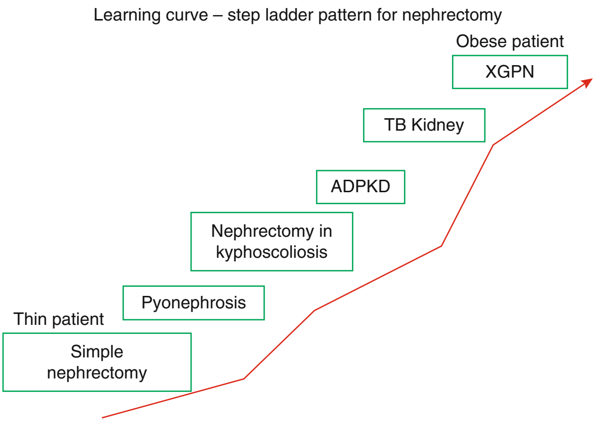


Fig. 2.4 Learning curve in laparoscopy

surgeon to predict the possible difficulties he is likely to face during the course of the operation. An improper selection of the case in the initial cases will not only undermine the confidence of the surgeon but will also slow the learning process.

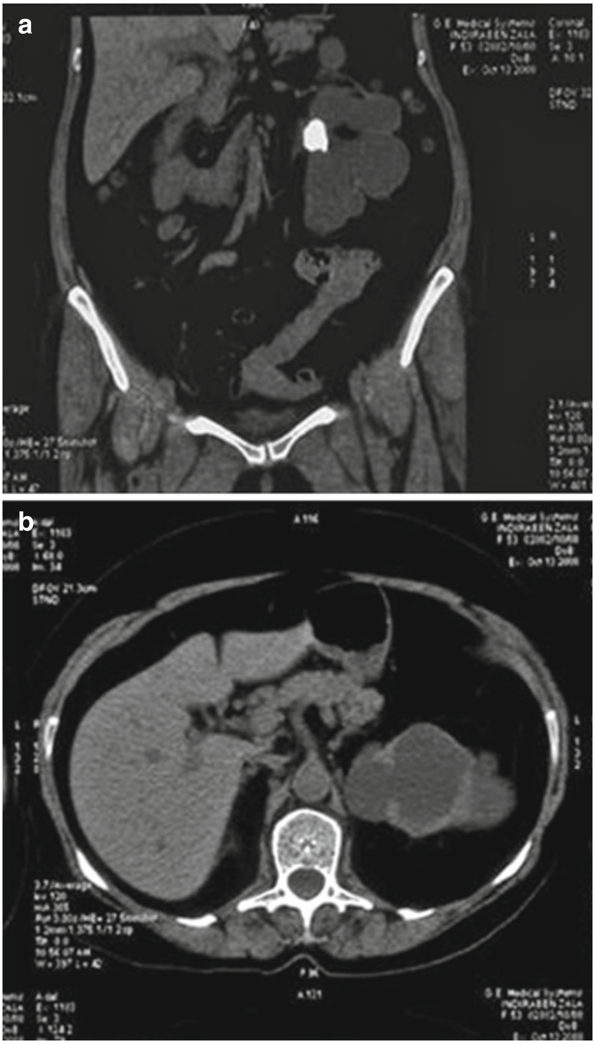
For example, the best case to start with for a nephrectomy would be a thin patient with no adhesions and a single vessel on CT angiography (Fig. 2.5). Although the right side is slightly easier for dissection than the left side, one has to be careful about the vena cava and the short adrenal vein. A thin patient is always desirable than an obese patient from point of view of the morbidity and ease of the procedure. The case selection should be as shown in Figs. 2.4 and 2.6.

2.5 Concluding Remarks

While the Halstedian model of unregulated apprenticeship served trainee surgeon well a century years, the surgical technology of the twenty-first century has increased demands on surgical education. Minimally invasive surgery has radically changed the 3-dimensional visualization and tactile feedback of open surgery. Laparoscopy has further challenged the trainee surgeon by creating a 2-dimensional working environment and reduced tactile sensation.

Being prepared to perform an operation no longer simply means reading the appropriate pages of surgical atlas. Before entering the operating room, the basic skills for minimally invasive procedure such as urological laparoscopy must be developed. This would result in marked improvement of level of care and reduced medicolegal cost. Despite extensive amount of data from the urological literature, the ideal training program in urological laparoscopy remains to be determined objectively. As of today, there is no single-structured and dedicated program for laparoscopic skills training. In view of differing heath-care policies globally, at the moment, the program is fractured. There is a consensus as to what an ideal program should be. It would consist of a combination of inanimate models, animal labs, and clinical exposure under a mentor through fellowship program.

Fig. 2.5 Case selection



BMI–23 kg/m^2
No perinephric stranding
Single artery and vein
Small non functioning kidney

The ideal training modality requires acquiring basic laparoscopic skills in a dry and wet skills laboratory, simultaneously also acquiring the laparoscopic skills under the guidance of a mentor and then finally doing the procedures independently.

As surgeons, we have a passion for what we do, and we do it to make it the best. To quote Alvin Toffler, "the illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn." Surgical education requires this same passion and desire for excellence.

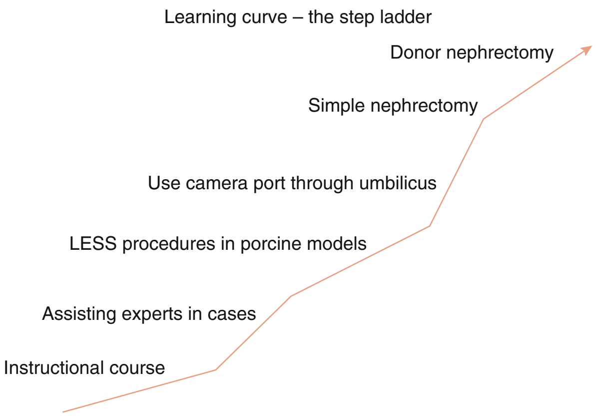


Fig. 2.6 How should one start doing laparoscopy?

References

1. Fahlenkamp D, Rassweiler J, Fornara P, et al. Complications of laparoscopic procedure in urology; experience with 2407 procedures at 4 German centers. J Urol. 1999;162:765–71.
2. Autorino R, Haber GP, Stein RJ, et al. Laparoscopic training in urology critical analysis of current evidence. J Endourol. 2010;24:1377–90.
3. Dausters B, Steinberg AP, Vassiliou M. Validity of the MISTELS simulator for laproscopy training in urology. J Endourol. 2005;19:541–5.
4. Beatty JD. How to build an inexpensive laparoscopic webcam based trainer. BJUI. 2005;96:679–82.
5. Boon JR, Salas N, Avila D. Construct validity of the pig intestine model in the simulation of laparoscopic urerhrovesical anastomosis: tools for objective evaluation. J Endourol. 2008;22:2173–716.
6. Laguna PA, Alacazar AA, Mochtar CA, et al. Construct validity of chicken model in simulation of laparoscopic radical prostatectomy suture. J Endourol. 2006;20:69–71.
7. Cavallari G, Tsivian M, Bertelli R, et al. A new swine training model of hand assisted donor nephrectomy. Transplant Proc. 2008;40:2035–7.
8. Ramachandran A, Kurien A, Patil P, et al. A novel training model for laparoscopic pyeloplasty using chicken crop. J Endourol. 2008;22:725–8.
9. McDougall EM, Elashry OM, Clayman RV. Laproscopic pyeloplasty in the animal mode. JSLS. 1997;1:113–8.
10. Nakada SY, Hedican SP, Bishoff JT, et al. Expert videotape analysis and critiquing benefit laparoscopic skills training of urologists. JSLS. 2004;8:183–6.
11. Jones A, Eden C, Sullivan ME. Mutual mentoring in laparoscopic urology-a natural progression from laparoscopic fellowship. Ann R Coll Surg Engl. 2007;89:422–5.
12. Zhang Xu, Zhang GX, Wang B-J, et al. A multimodality training program for laparoscopic pyeloplasty. J Endourol. 2009;23:307–11.
13. Zhang Xu, Wang B-J, Ma X, et al. Laparoscopic adrenalectomy for beginners without open counterpart experience, initial results under staged training. Urology. 2009;73:1061–5.
14. Lee BR, Bishoff JT, Janetschek G, et al. A novel method of surgical instruction: international telementoring. World J Urol. 1998;16:367–70.

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