

Educational system of laparoscopic gastrectomy for trainee—how to teach, how to learn

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Abstract: The feasibility of laparoscopic gastrectomy (LG) has been gradually proven by several scientific works, however, proper training method for this kind of surgery are still under investigation and debate. Here we report our educational system of LG to enhance the skill of young surgeons in our hospital. Our training program for trainee consists of 3 years of junior residency and 2 years of senior residency programs, requiring 5 years in total. In order to master LG, three following factors seem to be essential: learning, practice and experience. Learning means that trainee study techniques and concepts by educational materials, such as operative videos, lectures, or textbook. Practice means animal laboratory training or dry box training to acquire hand-eye coordination or bi-hand coordination, leading to precise movement of surgical devices. Experience means actual on-site training, participating in clinical LG as scopist, assistant or operator. In the actual surgery, we have some common principles for scopist, assistant and operator, respectively, and these principles are shared by entire surgical team. These principles are transmitted from trainer to trainee using simple keywords repeatedly. In conclusion, combination and balance of the three factors, learning, practice and experience are necessary to efficiently advance education of LG for trainee and may leads to benefits for gastric cancer patients.

Keywords: Laparoscopic gastrectomy (LG); education system; trainee

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Introduction

Laparoscopic gastrectomy (LG) are firstly reported by Kitano *et al.* in 1994 (1) and now widely spread to East Asian countries. Japan Society for Endoscopic Surgery (JSES) reported 34.0% of the gastrectomy for gastric cancer is performed under laparoscopy in Japan, in 2013. Laparoscopic distal gastrectomy (LDG) for early gastric cancer has been accepted as a standard procedure for experienced laparoscopic surgeons following the results of feasibility studies conducted in Japan and Korea (2,3). Although low complication rate was shown in these trials, the surgeons who performed surgery included in these studies were so-called “expert” surgeons because the criteria as for operator in these trials was restricted to surgeons with

experiences of at least 30–80 laparoscopic gastrectomies. Feasibility of laparoscopic surgery performed by trainee is still debatable and only a few studies had been existed so far describing its educational system. It is reported that less than 50% of educational institution of LG in Japan and Korea adopt their own educational program for trainee (4). Here we report our own educational system for LG for trainee in our hospital.

Early period after introduction of LG in our institution

We introduced LG for gastric cancer in 2010, and recently our hospital became one of the high-volume centers

Table 1 Factors associating mastering LG

Factors	Materials
Learning	Operative videos with explanation
	Presentation/lecture
	Textbook
Practice	Task in the dry box (suturing, handling surgical forceps etc.)
	Animal laboratory training
Experience	Participation of actual LG

LG, laparoscopic gastrectomy.



Figure 1 Typical educational video. This video shows the typical exposure of operative field of supra pancreatic lymph node dissection in LDG for early gastric cancer. Trainee can learn typical exposure named “the first, second and third point of view” as shown in this video with marks and titles (6). LDG, laparoscopic distal gastrectomy.

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regarding LG in Japan. Standardized procedure was introduced by an expert surgeon. Standardized surgical procedure and environment are described in “laparoscopic manuals” edited in our institution, which could be shared not only with surgeons but with surgical co-medicals, such as nurses or medical engineer, finally established a “laparoscopic team”. As surgical procedures or used devices were improved and changed, these contents were reflected to our manual. The significance of team participation training system was reported previously by us (5).

Characteristics of our residency program

Around 300 cases of gastrectomy for gastric cancer are

performed annually and currently 70–80% of the cases are operated laparoscopically. Trainee who wants to work in our division usually apply for our residency program at 5–8 post-graduation years after they have acquired the board certification from Japan Surgical Society. Our residency program consists of 3 years program as junior resident and 2 years program as senior resident. In the first 2 years of the junior residency program, actually they work at gastric surgery division only for 6 months, and for the rest period rotate in other surgical divisions (esophageal, hepato-biliary pancreatic and colorectal surgery), pathological division and medical oncological division to learn widely oncology and basic skills of gastroenterological surgery.

The last year of junior resident are specialized in the training program of gastric surgery division. Senior residency program are aiming to more deepen their knowledge and skills as gastric surgeons.

Three factors for mastering laparoscopic surgery

Learning, practice and experience are the three indispensable factors for mastering LG as shown in *Table 1*.

“Learning”: learn the standardized procedure

Trainees learn the standardized reproducible procedure thorough the non-edited operative video performed by trainer repeatedly as well as textbook to learn ideal exposure of operative field. The typical exposure of operative field for supra pancreatic lymph node dissection are demonstrated in *Figure 1*.

“Practice”: practice using the dry box

Trainee should practice laparoscopic suturing techniques or handling of surgical devices through the training using the dry box. Hand-eye coordination and peculiar movement of laparoscopic surgery could be acquired by effective creative tasks in the dry box before participating in actual surgery as shown in *Figure 2*.

“Experience”: participate in actual laparoscopic surgery

In our division, junior resident participate in laparoscopic surgery basically as a scopist in their first year. After they experienced five to ten cases as a scopist and understood the standardized procedure, they can promote to an assistant of LDG or an operator of easier laparoscopic surgery, such as

staging laparoscopy or laparoscopic gastrojejunostomy. At the same time, they can also experience open gastrectomy as well. Trainee performs their first LDG as an operator after ten to twenty experiences as assistant. At the third year of junior resident or the first year of senior resident, they can take the examination to obtain certification of endoscopic surgical skill qualification system of JSES (8). Training program of our residency system was summarized in *Figure 3*.



Figure 2 Suture training in dry box. This video shows the example of training tasks in the dry box (7).

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The principles for our surgical team to play each role in laparoscopic surgery

We have following common principles and concepts as described below.

The principles for scopist

Show the typical view

A 10 mm flexible scope is routinely used in our institution. The operator and the assistant have to make the standardized operative field, and the scopist have to show these reproducible operative fields. Discrepancy of the typical view shown by scopist could lead to misunderstanding of surgical anatomy, which may be associated with unexpected injury of other organs.

Avoid collision between scope and other surgical devices

Scopist should recognize intraabdominal positional relationship of each surgical device, and control scope position not to conflict with other devices. This principle must be recognized by operator and assistant as well, always considering provision of space for scope.

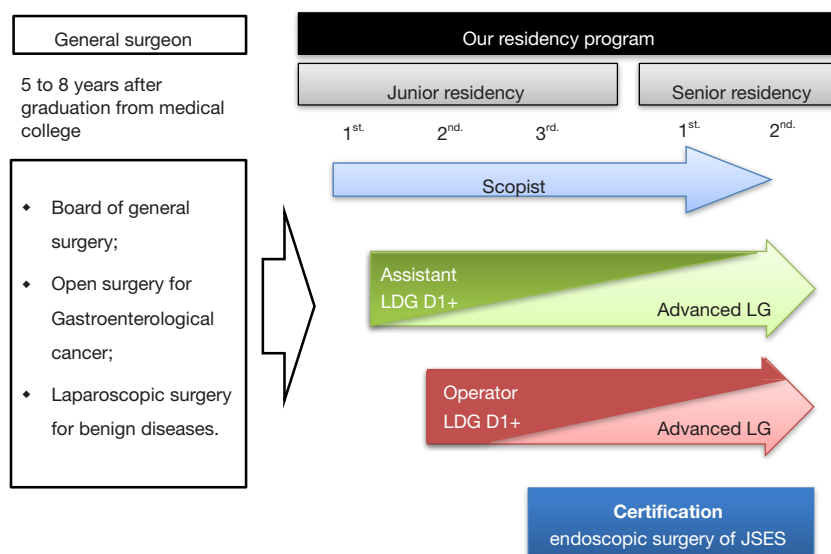


Figure 3 Our residency program. Trainees of our residency program are surgeons in fifth to eighth post graduate years. They experience laparoscopic gastrectomy as a scopist, an assistant and an operator as shown in this figure. They also take examination of the certification examination of certification of endoscopic surgical skill qualification system of JSES. LG, laparoscopic gastrectomy; LDG, laparoscopic distal gastrectomy; JSES, Japan Society for Endoscopic Surgery.

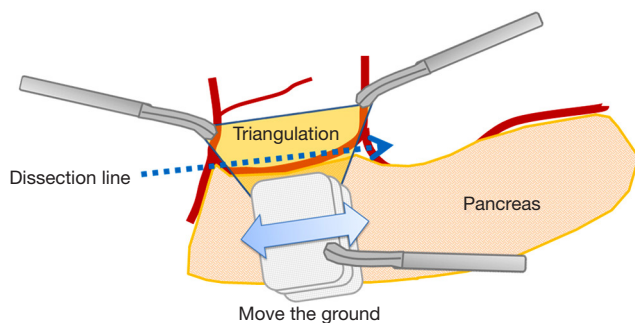


Figure 4 The concept of “triangulation” and “move the ground”. The operator and assistant expose the operative field as triangle shape. The axis of surgical devices treated by operator are usually fixed, thus dissection line should be adjusted by move the ground method.



Figure 5 The concept of “triangulation” and “move the ground” in dry box. This video shows the concept of “triangulation” and “move the ground”. Trainee can practice exposure of operative field using dry box training as shown in this video (9). Available online: <http://www.asvide.com/articles/1334>

Show surgical devices not blindly

Any energy devices have possibility to give thermal injury to other organs, such as pancreas or major vessels due to blind activation and cavitation. Scopist should pay maximum attention to show the active blade of energy devices as possible to avoid blind procedures. For this, articulating function of the flexible scope is very useful.

The principles for assistant

Basic step of assistant begins with exposure of typical operative field in LDG for early gastric cancer. More advanced procedures, such as total gastrectomy with splenic hilar dissection for advanced gastric cancer, require more

complicated exposure of surgical field, thus assistant should understand surgical anatomy and operative procedure very well. The principles for assistant which are decided in our institution to expose the good operative field are as follows.

Triangulation and move the ground

Triangle formation to expose the operative field with proper tension can be made using two forceps handled by assistant and left hand forceps of operator (triangulation). In laparoscopic surgery, the axis of surgical device is fundamentally fixed by the trocar. Thus, operator and assistant should adjust the dissection line to the axis of surgical energy devices driven by operator's right hand by moving organs (move the ground) as shown in *Figures 4, 5*. Delicate organs, such as pancreas, should be handled gently using gauze grasped by assistant to prevent related complications, such as pancreatic leak or pancreatitis.

The principles for operator

Needless to say, basic skills, such as stable movement of forceps/energy devices, vessel ligation or hemostatic techniques, should be mastered. Moreover, advanced surgical knowledge regarding lymph node dissection (proper dissection layer, anatomical landmark) or reconstruction (intracorporeal stapling techniques) should be fully understood.

How to teach and how to learn the laparoscopic surgery efficiently?

Because of the complexity of the relevant anatomy, LG had been thought to be difficult to be learned or performed by young surgeons. Detailed standardization of the procedure not only for surgeons but also for co-medical staffs seems to play a pivotal role for it. Although in several situations in actual clinical surgery standardized procedure will not fit due to tumor progression or patient's specific condition, such as obesity, fragility of tissue and adhesion. However, if the principle for surgical performance is decided and shared by surgical team, we can overcome tough situation. Trainer should make effort to teach these methods to trainee using understandable key words such as “triangulation”, “move the ground”, “no conflict” repeatedly. Trainees should fully understand meanings of these words and practice task in the dry box with purposes, and discuss with trainer or other surgical team members.

In conclusion, we believe, combination of the three

factors “learning”, “practice” and “experience” are the key words for mastering LG. Trainer should transmit standardized reproducible procedures to trainee using understandable words repeatedly, and trainee should trace trainer’s manner repeatedly.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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