Original Article

The Learning Curve of Laparoscopic Colorectal Surgery in Regional Hospital

Peng-Sheng Lai[1]
Yi-Chung Hou[1]
Tung-Cheng Chang[1]
Chi-Hsiang Hung[1]
Hung-Mao Lin[1]
Jin-Tung Liang[2]
[1]*Department of Surgery, National Taiwan University Hospital, Yun-Lin Branch, Yun-Lin County*
[2]*Department of Colorectal Surgery, National Taiwan University Hospital, Taipei, Taiwan*

Key Words
Laparoscopic colectomy;
Learning curve

Purpose. In the early 1990s, laparoscopic colon surgery was shown to be technically feasible and was applied to managing benign and malignant colon disease. Few published discussions describe the learning curve for performing this procedure in regional hospital. Here we present our surgical experience and early outcomes for laparoscopic colorectal resection.
Methods. Our laparoscopic surgical team comprised well trained colorectal surgeons without prior experience performing laparoscopic colorectal surgery. From August 2008 to January 2009, we performed 30 laparoscopic colorectal surgeries. Two equal, consecutive groups, the first 15 cases (group A) and later 15 cases (group B), were retrospectively reviewed. Patient demographics, perioperative parameters and early outcomes (i.e., operative times, blood loss, length of stay, need for technique assistance, complications, conversion to open surgery) were recorded. Surgical experience and outcomes were analyzed to document our learning curve.
Results. No significant differences were found between groups in surgical procedures, gender ratios and difficulty of operative procedures. Group B had shorter operative times, earlier recovery of gastrointestinal function, less blood loss, and shorter hospital stays without significant differences. Significant differences between groups included higher ages in group B and higher incidence of calls for technical assistance in group A. The groups' complication rates were identical. Group A had the only case of conversion to open surgery. Operation times and blood loss decreased significantly after case 16.
Conclusions. Laparoscopic colorectal resection can be performed safely in regional hospital. Assistance from a surgeon experienced in laparoscopic colorectal resection helped, colorectal surgeons with laparoscopic experienced (laparoscopic cholecystectomy and laparoscopic appendectomy) achieve proficiency at 16 cases.
[*J Soc Colon Rectal Surgeon* (*Taiwan*) *2010;21:1-8*]

Laparoscopic colon resection was first described in 1991[1] and was slow to gain acceptance initially. Some early reports of port-site recurrence and varying effects of pneumoperitoneum on tumor biology prompted several studies that investigated outcomes and survival rates.[2] However, in recent decades, prospective randomized studies have demonstrated that the long term outcome after laparoscopic resection for colorectal cancer is comparable to that of open surgery.[3,4]

Received: April 22, 2009. Accepted: July 13, 2009.
Correspondence to: Dr. Jin-Tung Liang, Department of Surgery, National Taiwan University Hospital, Yunlin branch, No. 579, Sec. 2, Yunlin Rd., Douliou City, Yunlin 640, Taiwan. Tel: +886-5-531-3911 ext. 5885; Fax: +886-5-537-9742; E-mail: yabu71@yahoo.com.tw

Patients receiving laparoscopic colon resection have the accepted advantages of laparoscopic effects such as shorter hospital stays, shorter durations of postoperative narcotics use, and decreased intervals until return of bowel function and oral intake.[4-7] However, even when performed by experienced surgeons, laparoscopic colorectal surgery takes more operation time when compared to open colorectal surgery. Laparoscopic colorectal surgery is a technically difficult operation that requires a skilled and attentive surgical team for its successful completion, a requirement that has slowed the widespread use of laparoscopic colon surgery.

In Taiwan, only 5% to 10% of colon cancer patients receive laparoscopic colorectal resection and most of them are hospitalized in larger medical centers. The aim of this study was to assess factors related to the learning curve for performing laparoscopic colorectal surgery and to determine whether or not it is feasible for this surgery to be performed in regional hospital.

Patients and Methods

We organized a laparoscopic colorectal surgery team in January 2008. The team consisted of two principal surgeons who were trained, experienced colorectal surgeons whose experience included performing over 50 open colorectal surgeries. Each surgeon had also maintained a practice in laparoscopic surgery, performing over 50 cases of laparoscopic cholecystectomy or laparoscopic appendectomy. The team's initial training consisted of a one-month laparoscopic course in the colorectal unit of National Taiwan University Hospital.

An experienced professor, whose laparoscopic colorectal surgery experience included over 600 cases, served as a supervisor of our surgical team. All operations were performed by one of two attending surgeons and if any difficulties occurred during laparoscopic colorectal surgery, the team relied on the supervisory surgeon to provide assistance with operative technique.

Beginning in August 2008, we began to routinely perform laparoscopic colorectal surgery. All patients diagnosed as colorectal cancer were referred to the laparoscopic team. Patients with synchronous or metachronous colon cancer and patients with cancer perforation were excluded from the study. Patients who had received lower abdominal surgery previously were also excluded. In total, 30 colon cancer patients underwent laparoscopic colon resection in the National Taiwan University Hospital, Yun-Lin Branch, between August 2008 and January 2009.

For the anesthesiologists performed central venous catheter (CVP) or epidural patient-controlled analgesia (PCA) insertion after anesthesia. The anesthesia times were variation from 15 to 55 mins to "real" operation times. The operation times we recorded here were start from the incision time, not including the per-operative setting times.

In this study, 30 patients were received surgery by one operator and same surgical team. The surgical instruments and operative procedures did not change in these 30 patients. First, the patients were in lithotomy position. Four or five trocars were placed in the abdominal wall. After insufflating carbon dioxide gas, the abdominal wall was tented away from the intestine. Second, electronic video laparoscope was used for better vision in pelvic cavity and laparoscopic medial-to-lateral approach was performed for the curative resection colorectal cancer. The major vessels were high ligated by endoclips 10mm or endo-GIA universal straight 30-2.5 mm, mesocolon resection was performed by endo-Ligasure 5 mm. We divided the distal end of colon (or rectum) with endo-GIA universal roticulator 45-3.5 mm and pull the lesion colon out of the abdominal wall through one extent working port. In laparoscopic right and left hemicolectomy procedures, we divided the cancer lesion with safety margin and extracorporeal anastomosis with hand-sewn suture. In laparoscopic anterior resection or low anterior resection procedures, we performed intracorporeal anastomosis with CEEA stapler 31.

One rubber drain was placed though the previous working port to check leakage in these 30 patients.

Patient demographics, including age, gender, operative procedure, and perioperative parameters such as operation time, blood loss, time of recovery of gastrointestinal function, length of hospital stay, complication rate, need for technical assistance, and conver-

sion rate were recorded and analyzed.

We classified different operative procedures and times as low or high on the basis of degree of difficulty.[8] The low-difficulty group included right hemicolectomy, anterior resection. The high-difficulty approach consisted of left hemicolectomy and low anterior resection (LAR) and abdominoperineal resection.

The learning curve was defined as the operative times required for each procedure to reach a nadir at which the times of the subsequent procedures did not vary by more than 30 minutes.[9]

Statistical analysis

Statistical analyses were performed using one-way ANOVA and chi-square methods for comparison of variables among the two groups. Significance was determined as having a p value of < 0.05. The least significant difference method was used for further examination of differences in perioperative parameters between the groups.

Results

For the purpose of recording results and documenting the learning curve, the 30 consecutive patients were divided into two equal groups (A = the early group of 15 patients, and B = the later group of 15 patients) for analysis.

Surgeries performed included right hemicolectomy (n = 2), left hemicolectomy (n = 2), anterior resection (n = 14), low anterior resection (LAR) (n = 10) and abdominoperineal resection (n = 2). In the early group (group A), one patient received right hemicolectomy, 7 patients received anterior resection, 2 patients received left hemicolectomy, 4 patients received LAR, and one patient received abdominoperineal resection. In the later group (group B), one patient received right hemicolectomy, 7 patients received anterior resection, 6 patients received LAR, and one patient received abdominoperineal resection. The operative procedures were similar in both groups, and showed no significant differences. ($P < 0.05$)

The mean operative times were 195 minutes for right hemicolectomy, 270 minutes for left hemicolecotmy, 207.5 minutes for anterior resection, 229.5 minutes for LAR, and 232.5 for abdominoperineal resection (Table 1).

We designed the technique difficulty of operation procedures into two groups by the mean operation time. The low-difficulty operation group (n = 16), including right hemicolectomy and anterior resection, required less operation time. The high-difficulty operation group consisted of 14 cases receiving left hemicolectomy, LAR, or abdominoperineal resection.

The age in group B was older than group A and reach significant difference. ($P = 0.027$) No significant differences were found between the two groups in the male-to-female rate or difficulty of operative procedures ($P = 0.116$, 1) (Table 2).

Mean operative time and blood losses were lower in group B than in group A, but differences did not reach statistical significance ($P = 0.083$, 0.365) (Table 3).

Decreases in the time of first flatus and the length of hospital stay were noted in group B, but did not reach statistical significance ($P = 0.254$, 0.234). Four postoperative complications occurred, including prolonged ileus, wound infection and anastomosis leakage. Each group had two complications. No differences were noted in the postoperative complication

Table 1. Procedures of group A and B

Variables	Group A	Group B	Total case number	Mean operation time
Anterior resection	7	7	14	207.5
Right hemicolecotmy	1	1	2	195
Left hemicolectomy	2	0	2	270
Lower anterior resection	4	6	10	229.5
APR	1	1	2	232.5

Table 2. Comparison of demographic data for group A and B

Variables	Group A (n = 15)	Group B (n = 15)	P value
Age	66.5	70.5	0.027
Sex (male: female)	12/3	10/5	0.116
Low difficulty Operation procedure	8	8	1
High difficulty Operation procedure	7	7	1

rates between groups A and B. A significantly higher incidence of calls for technical assistance was noted in group A (P = 0.002). Only one case of conversion to open surgery occurred in the early group (group A) (Table 3).

The blood losses were much more at the beginning of the study. By the experience gaining, the blood losses were significant decrease. The curve of blood loss keep standard below 100 c.c. at case 20. (Fig. 1)

The operative time for each group is shown in Figs. 2 and 3. In the low difficulty group, the mean operation times dropped to a low point of 150 min at cases 16. In the high difficulty group, the mean operation times declined to a nadir of 140 min at cases 20. Thus, in both sets, 16 to 20 laparoscopic colectomy were required for adequate learning.

Discussion

National Taiwan University Hospital, Yun-Lin Branch is a 600-bed rural hospital providing acute care facilities for the people of Touliu city and the surrounding rural communities. Touliu city is located in southern Taiwan and has a population of 100,000. Most people in Touliu are engaged in agriculture or forestry and are of a lower socio-economic status.

In August 2008, in order to provide more surgical options for colorectal cancer patients, our hospital decided to begin performing laparoscopic colorectal resections. Two colorectal surgeons completed a one-month laparoscopic training course in the National Taiwan University Hospital colorectal unit. An experienced professor (with personal laparoscopic colorectal surgery experience over 600 cases) was desig-

Table 3. Comparison of mean perioperative parameters for groups A and B

Variables	Group A (n = 15)	Group B (n = 15)	P value
Operative times	268	163	0.083
Blood loss	199	63	0.365
First bowel movement	3.8	2.9	0.254
Length of stay	11.5	9.2	0.234
Complication	2	2	1
technical assistance	4	1	0.002
Conversion	1	0	0

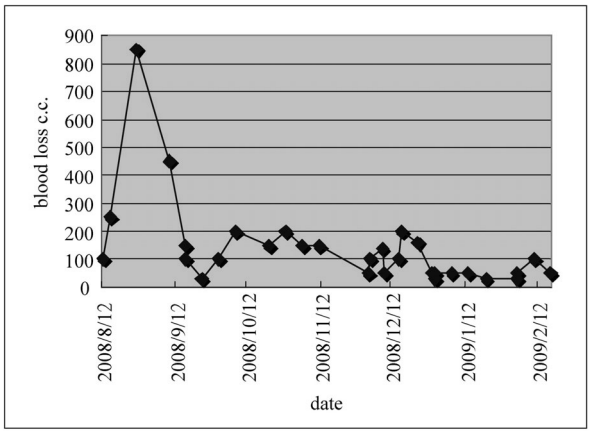

Fig. 1. Blood loss over the study period.

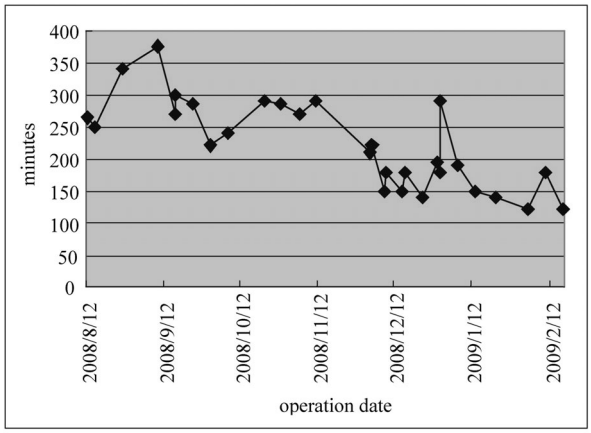

Fig. 2. The learning curve of operation time for laparoscopic colectomy.

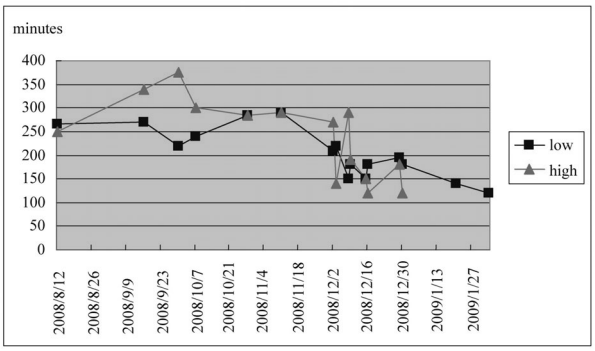

Fig. 3. The operation time for high-difficulty procedure and low-difficulty procedure. Low-difficulty procedures (n = 16) included right hemicolectomy (n = 2) and anterior resection (n = 14). High-difficulty procedures (n = 14) involved low anterior resection (n = 10) and left hemicolectomy (n = 2) and APR (n = 2).

nated as lead surgeon and the supervisor of the surgical team.

Laparoscopic colorectal surgery is technically challenging, including performance of operations that frequently involve two or more abdominal quadrants, control of large blood vessels, identification of extraperitoneal structures such as the ureters, and intra or extracorporeal reconstruction of intestinal continuity.[3] These highly technical laparoscopic thresholds may affect initial early outcomes and limit the progression of laparoscopic colorectal resection surgery within an institution. In this study, we evaluated the learning curve for performing laparoscopic colorectal resection in a rural community hospital based on the initial outcomes of our first 30 elective operations.

Because colon resection encompasses several similar but distinctly separate operations (right hemicolectomy, left hemicolectomy, anterior resection, LAR, and abdominoperineal resection), the degree of difficulty of colorectal resection can not be considered equal across all procedures. Even in open colorectal surgery, left hemicolectomy and LAR are typically more difficult and time consuming than right hemicolectomy and anterior resection.[10]

Our results showed that different laparoscopic surgical procedures had significant variations in mean operation time. The mean operative times were longer in left hemicolectomy, LAR or APR, largely because of the difficulty of anatomical dissection and loss of orientation or landmarks during procedures.

Other possible confounding factors include patient variables such as gender, age, and surgical indications. In laparoscopic surgery, as in open surgery, the female anatomy is generally more favorable in terms of pelvic cavity dissection.[2] In our study, the male to female ratio in the early group was 12/3 and 10/5 in the later group, with no significant difference in the p value.

To decrease surgical risk during the laparoscopic learning curve, the patients who had received lower abdominal surgery previously were excluded from the study. Generally, we find more adhesions in older patients, whereas younger and healthier patients are less likely to have prior surgery or adhesions that may add to technical difficulty.[2] The mean age of group A was younger than that of group B (66.5 v.s. 70.5) and significant difference in the p value.

The learning curve for performing laparoscopic colorectal surgery should reflect the number of cases needed to conduct these procedures with a reasonable rate of significant complications.[11-16] It is important to evaluate operation times, complication rates, and blood loss to help determine and document the learning curve. In our series, blood loss and operative time decreased significantly at case 16, indicating the point at which proficiency had been achieved in performing laparoscopic colorectal surgery.

The operative time in laparoscopic colorectal surgery is longer than in open procedures even when performed by experienced surgeons.[3] Nevertheless, operation times do decrease along the learning curve, as shown in our series and others.[11-16] In the present study, the mean operation time for laparoscopic colorectal resection was 268 minutes in the early group, while the current estimatation of operation time for this procedure is 163 minutes given the development of instruments and accumulation of surgeon experience.

Transfusion of blood during the hospital stay had a negative impact on survival of patients with colorectal cancer. Similar results have been reported in other studies. Possible explanations for this may be that blood transfusion can have a negative immunological effect.[17] Under laparoscopic vision, the pelvic anatomy is viewed more clearly and dissection can therefore be more precise. It is important to ligate vessels precisely, not only to decrease the need for blood transfusion, but also to preserve the quality of anatomic viewing, which can become obscured if bleeding occurs during the laparoscopic surgical procedure. In our series, blood loss was less in the later group (group B) than in the early group (group A), and the need for blood transfusion was correspondingly rare in the later group.

Several studies have shown better clinical outcomes after surgeons have gained experience in performing laparoscopic procedures.[11-16] In this study, the patients in the later group (group B) had shorter times to first flatus and bowel movements, earlier commencement of oral intake, and shorter hospital stays than patients in the earlier group (group A).

Several other studies have demonstrated the im-

pact of surgeon experience on complications, showing a significant decrease in the complication rate as experience is gained.[19,20] Agachan et al.[19] reported similar results and concluded that at least 50 procedures are necessary to lower the complication rate significantly. Another study by Bennett et al.[11] demonstrated that fewer complications occurred in procedures performed by surgeons who had performed more than 40 cases.

In our series, only one case of conversion to open surgery occurred in the early group and none in the later group. Four cases of calls for the supervising surgeon's assistance took place during surgeries performed for the early group and only one case during surgeries for the later group. We believe that having a complete laparoscopic colorectal resection training program and a supervisor to provide technological guidance was a significant influence on reducing the conversion rate during the learning curve for performing laparoscopic colorectal resection. For example, the supervisor is readily able to point out where the problem is and encourage the less experienced surgeons to overcome difficulties in the laparoscopic procedures; this transmission of experience was shown to help shorten the learning curve of performing laparoscopic colorectal resection.

Four postoperative complications occurred in our series, including one anastomosis leakage in case number 3, one small intestinal obstruction in case number 16, and two cases of wound infection (cases number 6 and 17). Although the complication rate was same in both groups, two postoperative complications in the early group were much major complications. In surgeries performed for patients with rectal cancer at the upper to middle rectum, we created a protective ileostomy and administered total mesorectal excision, which might help to decrease major complications during laparoscopic colorectal surgery.

Conversion rate, as well as intra-operative and postoperative complication rates and operative times, has been used as indicator of proficiency, and has been much examined for trends.[20-24] In our study, the conversion rate during the learning curve was notably low. Only one case was conversion to open surgery in the early group. Our operative times for this technique decreased significantly after the first 16 cases. This improvement represents our acquired aptitude as we gained experience and progressed along the learning curve. Previous learning curve studies recommended a varied number of cases, ranging from 11 to 80, to achieve proficiency with laparoscopic colon resection.[11-16] We believe there are several reasons why we were able to shorten the learning curve in our series. First, by engaging the help of a respected laparoscopic colorectal resection training program and having the support of the whole surgical team, we were able to perform 30 laparoscopic colorectal resections in six months. To optimize learning and shorten the learning curve, we found it was important to accumulate a sufficient number of cases within a short time. Second, having an experienced laparoscopic colectomy surgeon as a supervisor can help to solve laparoscopic surgery problems in the beginning of the learning curve and, indeed, point out techniques to help us avoid mistakes. As our result have shown, the incidence of calls for assistance were more frequent in surgeries of the early group, but as the team surgeons gained experience, no calls for assistance were made during surgeries of the later group.

The study was not primarily designed to look at oncological outcomes of laparoscopic colorectal surgery, which would require subsequent follow up. We tried to determine the adequacy of resection based on resection margins and lymph nodes yielded in laparoscopic colorectal resection patients. Most of our surgical procedures involved at least a 2 cm distal safety margin and D2 lymph node dissection.

Conclusion

Laparoscopic colorectal resection is technically feasible and safe to perform in rural hospitals. The procedure was shown to result in early postoperative recovery and shorter hospital stays. After undergo a complete laparoscopic colorectal resection training program and surgical department coordination, the surgery can be taken up by colorectal surgeons who only had laparoscopic cholecystectomy and laparoscopic appendectomy experienced before. No extra significant mortality was noted during the learning curve. Having an experience laparoscopic colorectal

surgeon as supervisor of the surgical team was shown to result in shortening the learning curve and reducing the rate of conversion to open surgery. Our laparoscopic team was able to overcome the learning curve at case number sixteen.

References

1. Phillips EH, Franklin M, Carroll BJ, Fallas MJ, Ramos R, Rosenthal D. Laparoscopic colectomy. *Ann surg* 1992;216: 7137.
2. Kim J, Edwards E, Bowne W, Castro A, Moon V, Gadangi P, Ferzli G. Medial-to-lateral laparoscopic colon resection: a view beyond the learning curve. *Surg Endosc* 2007;21(9): 1503-7.
3. Avital S, Hermon H, Greenberg R, Karin E, Skornick Y. Learning curve in laparoscopic colorectal surgery: our first 100 patients. *Isr Med Assoc J* 2006;8(10):683-6.
4. Nelson H, Sargent D, Wieand HS, Wieand HS, Fleshman J, Anvari M, Stryker S, Beart R, Hellinger M, Flanagan R, Peters W, Ota D. Laparoscopically assisted colectomy is as safe and effective as open colectomy in people with colon cancer for the Clinical Outcomes of Surgical Therapy Study Group. A comparison of laparoscopically assisted and open colectomy for colon cancer. *N Engl J Med* 2004;350:2050-9.
5. Veldkamp R, Kuhry E, Hop WC, Jeekel J, Kazemier G, Bonjer HJ, Haglind E, Påhlman L, Cuesta MA, Msika S, Morino M, Lacy AM. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. *Lancet Oncol* 2005;6:477-84.
6. Guillou PJ, Quirke P, Thorpe H, Walker J, Jayne DG, Smith AMH, Heath RM, Brown JM. Short-term end points of conventional vs laparoscopic-assisted surgery in patients with colorectal cancer (MRC CLASICC trial): multicentre, randomized controlled trial. *Lancet* 2005;365:1718-26.
7. Lacy AM, Garcia-Valdecasas JC, Delgado S, Castells A, Taura P, Pique JM, Visa J. Laparoscopy-assisted colectomy vs open colectomy for treatment of nonmetastatic colon cancer: a randomized trial. *Lancet* 2002;359:2224-9.
8. Jamali FR, Soweid AM, Dimassi H, Bailey C, Leroy J, Marescaux J. Evaluating the degree of difficulty of laparoscopic colorectal surgery. *Arch Surg.* 2008 Aug;143(8):762-7.
9. Kang JC, Jao SW, Chung MH, Feng CC, Chang YJ. The learning curve for hand-assisted laparoscopic colectomy: a single surgeon's experience. *Surg Endosc* 2007;21(2):234-7.
10. Geis WP, Coletta AV, Verdeja JC, Plasencia G, Ojogho O, Jacobs M. Sequential psychomotor skills development in laparoscopic colon surgery. *Arch Surg* 1994;129(2):206-12.
11. Bennett CL, Stryker SJ, Ferreira MR, Adams J, Beart RW. The learning curve for laparoscopic colorectal surgery: preliminary results from a prospective analysis of 1,194 laparoscopic-assisted colectomies. *Arch Surg* 132:41-5.
12. Dinçler S, Koller MT, Steurer J, Bachmann LM, Christen D, Buchmann P. Multidimensional analysis of learning curves in laparoscopic sigmoid resection: eight-year results. *Dis Colon Rectum* 2003;46:1371-9.
13. Reissman P, Cohen S, Weiss EG, Wexner SD. Laparoscopic colorectal surgery: ascending the learning curve. *World J Surg* 1996;20:277-82.
14. Schlachta CM, Mamazza J, Seshadri PA, Cadeddu M, Gregoire R, Poulin EC. Defining a learning curve for laparocopic colorectal resections. *Dis Colon Rectum* 2001;44:217-22.
15. Simons AJ, Anthone GJ, Ortega AE, Franklin M, Fleeshman J, Geis WP, Beart RW. Laparoscopic-assisted colectomy learning curve. *Dis Colon Rectum* 1995;38:600-3.
16. Tekkis PP, Senagore AJ, Delaney CP, Fazio VW. Evaluation of the learning curve in laparoscopic colorectal surgery: comparison of right-sided and left-sided resections. *Ann Surg* 2005;242:83-91.
17. Amato A, Pescatori M. Perioperative blood transfusions for the recurrence of colorectal cancer. *Cochrane Database Syst Rev* 2006 Jan;25(1):CD005033. Review.
18. Larach SW, Patankar SK, Ferrara A, Williamson PR, Perozo SE, Lord AS. Complications of laparoscopic colorectal surgery. Analysis and comparison of early vs. latter experience. *Dis Colon Rectum* 1997;40(5):592-6.
19. Agachan F, Joo JS, Weiss EG, Wexner SD. Intraoperative laparoscopic complications. Are we getting better? *Dis Colon Rectum* 1996;39:14-9.
20. Agha A, Moser C, Iesalnieks I, Piso P, Schlitt HJ. Combination of hand-assisted and laparoscopic proctocolectomy (HALP): Technical aspects, learning curve and early postoperative results. *Surg Endosc* 2008;22:1547-52.
21. Hassan I, You YN, Cima RR, Larson DW, Dozois EJ, Barnes SA, Pemberton JH. Hand-assisted versus laparoscopic-assisted colorectal surgery: Practice patterns and clinical outcomes in a minimally-invasive colorectal practice. *Surg Endosc* 2008;22:739-43.
22. Guo DY, Eteuati J, Nguyen MH, Lloyd D, Ragg JL. Laparoscopic assisted colectomy: experience from a rural centre. *ANZ J Surg* 2007;77:283-6.
23. Lauter DM, Froines EJ. Initial experience with 150 cases of laparoscopic assisted colectomy. *Am J Surg* 2001;181:398-403.
24. Wishner JD, Baker JW Jr, Hoffman GC, Hubbard GW 2nd, Gould RJ, Wohlgemuth SD, Ruffin WK, Melick CF. Laparoscopic-assisted colectomy. The learning curve. *Surg Endosc* 1995;9:1179-83.

原　著

地區醫院的腹腔鏡大腸直腸手術之學習曲線

賴鵬升[1]　侯奕仲[1]　張東晟[1]　洪基翔[1]　林宏茂[1]　梁金銅[2]

[1]台灣大學附設醫院雲林分院　外科部

[2]台灣大學附設醫院　大腸直腸外科

目的　自 1990 年起，腹腔鏡大腸直腸手術以廣泛應用在良性及惡性的大腸直腸病變上。然而鮮少有文獻討論關於地區醫院的腹腔鏡大腸直腸手術之學習曲線。本篇研究目的是要分享於地區醫院發展腹腔鏡大腸直腸手術的一些經驗及結果。

方法　兩位之前沒有腹腔鏡大腸直腸手術經驗的直腸專科醫師於 2008 年八月至 2009 年一月實行 30 例腹腔鏡大腸直腸手術，比較前 15 例 (A 組) 和後 15 例 (B 組) 病患之術前資料 (年紀，男女比例，手術難度) 及早期術後結果 (如：手術時間，術中出血量，是否尋求其他醫師協助，有無併發症，是否改成傳統剖腹手術)。根據術中經驗和術後結果觀察手術之學習曲線。

結果　A 組和 B 組病患就實行手術方式，男女比例，手術難度方面沒有差距。與 A 組病患比較，B 組病患手術時間較短，較早恢復腸道功能，出血量較少，住院天數較短，但這些數值均無達到顯著意義。有顯著意義方面有：B 組病患年紀較高，尋求醫師協助比例較少。兩組病患發生併發症比例相同，但 A 組有一位病患須改成傳統剖腹手術。手術時間及術中出血量隨經驗累積均漸漸減少，於第 16 位病患後趨於穩定。

結論　有良好腹腔鏡基礎 (腹腔鏡膽囊切除術和腹腔鏡闌尾切除術) 的大腸直腸專科醫師，在有經驗的腹腔鏡大腸直腸手術醫師的協助之下，可在地區醫院安全的實行腹腔鏡大腸直腸手術。腹腔鏡大腸直腸手術的學習曲線於第 16 位病患達到成熟期。

關鍵詞　腹腔鏡大腸直腸手術、學習曲線。