

*Case Analysis*

# Laparoscopic Assisted Right Hemicolectomy — 10 Years Experience in Chung-Hua Christian Hospital

Cheng-Hsien Chen

Hong-Chang Chen

Jau-Jie You

Tsang-Chi Lin

Hsuan-Yuan Huang

Ting-Ming Huang

*Division of Colorectal Surgery, Department  
of Surgery, Chang-Hua Christian Hospital,  
Chang-Hua, Taiwan*

---

**Key Words**

Laparoscopic surgery;

Right hemicolectomy;

Colon cancer

**Purpose.** Laparoscopic surgery has become the current trend for colorectal cancer. Thus Chang-Hua Christian Hospital has gathered and analyzed data based on ten years of experience in laparoscopic assisted right hemicolectomy.

**Materials and Methods.** This study retrospectively analyzed 89 patients who underwent laparoscopic assisted right hemicolectomy for colon cancer at Chang-Hua Christian Hospital between January 1999 to December 2008. During the same time period, 85 additional patients who underwent open right hemicolectomy were compared.

**Results.** Patients who underwent laparoscopic resections require significantly longer operation time compared to the open methods (208 min vs. 162 min,  $p = 0.036$ ) but suffered less blood loss (93 ml vs. 210 ml,  $p = 0.06$ ). There were no significant differences in the number of lymph nodes harvested for cancer resections (Scopy: 24 vs. Open: 22). Comparing post-operative recovery time, the laparoscopic group had a shorter delay for first time post-operative bowel movement (2.41 days vs. 2.76 days,  $p = 0.027$ ) and oral intake (1.66 days vs. 2.08 days,  $p = 0.019$ ). Furthermore, the laparoscopic group spent fewer days in the hospital (7.33 days vs. 11.44 days,  $p = 0.131$ ) and in addition had a lower complication rate compared with the open group (8.2% vs. 17.6%,  $p = 0.068$ ). The conversion rate was 4.5% (4/89). Comparing the 5-year survival rate for all stages, both groups have a similar survival rate (Scopy: 67.9% vs. Open: 67.9%,  $p = 0.531$ ). In stage I patients, there were no significant differences between both groups (Scopy: 87.5% vs. Open: 80.2%,  $p = 0.529$ ). In stage II patients, there were also no significant differences between both groups (Scopy: 73.5% vs. Open: 67.5%,  $p = 0.404$ ). The same result was noted in stage III patients (Scopy: 57.9% vs. Open: 61.7%,  $p = 0.663$ ). Comparing the 5-year disease free survival rate for all stages, both groups have a similar survival rate (Scopy: 68.3% vs. Open: 65.8%,  $p = 0.405$ ). In stage I patients, there were no significant differences between both groups (Scopy: 71.4% vs. Open: 80.2%,  $p = 0.502$ ). In stage II patients, there were also no significant differences between both groups (Scopy: 74.5% vs. Open: 65.2%,  $p = 0.272$ ). The same result was noted in stage III patients (Scopy: 55.6% vs. Open: 58.4%,  $p = 0.610$ ). Local recurrent rate was 1.18% in scopy group and 3.53% in open group.

**Conclusion.** Based on research and experience, laparoscopic assisted right hemicolectomy is a safe and feasible technique.

*[J Soc Colon Rectal Surgeon (Taiwan) 2012;23:19-26]*

---

Received: March 11, 2011.

Accepted: September 17, 2011.

Correspondence to: Dr. Hong-Chang Chen, Division of Colorectal Surgery, Department of Surgery, Chang-Hua Christian Hospital, No. 135, Nan-Hsiao Street, Chang-Hua, Taiwan. Tel: +886-4-723-8595 ext. 3681; Fax: +886-4-722-8289; E-mail: 54464@cch.org.tw

Laparoscopic surgery has become widely accepted for treatment of colorectal diseases because of less pain, less blood loss, early recovery of bowel function, and shorter hospital stay.<sup>1-6</sup> Most importantly, laparoscopic colorectal resections can offer the same oncologic outcome as open surgery.<sup>1-12</sup> Most of the published information on this subject focused on many different types of laparoscopic assisted resections. Very few studies focused on right-sided laparoscopic resections. Chang-Hua Christian Hospital began to perform laparoscopic assisted resections in 1999. The aim of the study is to compare the short-term and long-term outcome between laparoscopic assisted right hemicolectomy and open right hemicolectomy.

## Patients and Methods

This study retrospectively analyzed 89 patients that underwent laparoscopic assisted right hemicolectomy for colon cancer at Chang-Hua Christian Hospital between January 1999 to December 2008. During this same time frame, 85 additional patients were enrolled in the control group. Those who were classified as stage IV and local recurrence were excluded. Laparoscopic surgeries which converted to open methods were also excluded.

The operations were performed by different surgeons in the Colorectal Surgery Department. Radical operations were performed in both groups. Laparoscopic assisted right hemicolectomy commenced after insertion of a camera port below the umbilicus and the use of two to three other ports, depending on the patients clinical condition. Transection of the ileocolic and right colic vessels was performed intra-corporeally with LigaSure Vessel Sealing System. Mobilization of bowel from the ileum to the proximal transverse colon was performed via a medial to lateral approach. The specimen was extracted through extension of the camera port wound. Transection of bowel and creation of a functional side-to-side ileocolic anastomosis was completed extra-corporeally with linear staples. Open right hemicolectomy was performed via a midline incision. Mobilization of colon was performed using a lateral to medial approach.

This was followed by division of vessels and the creation of a side-to-side anastomosis with linear staples.

Pre-operative staging were evaluated by chest X-ray, ultrasound and/or computed tomography. Pathologic staging was according to AJCC Cancer Staging Manual, 6th edition.<sup>13</sup> All the specimen were reviewed by the pathologists.

All the patients were evaluated for tumor recurrence as follows: physical examination (including checking for recurrence at wound sites) and carcinoembryonic antigen testing every 3 months for the first year followed by a check-up every 6 months until year 5 is completed. A chest X-ray is taken every 6 months for 2 years and then annually for the remaining 3 years. Finally a total colon evaluation is given every 3 years. Confirmation of recurrence requires imaging or pathologic evaluation.

Demographic data such as age, gender, body mass index (BMI), ASA status, tumor location and pathologic staging were assessed. Operative parameters such as operative time, blood loss, lymph nodes harvested were also assessed. Post-operation parameters (day for first bowel movement, day for starting oral intake, length of hospitalization and complication rates) were also obtained.

Overall survival was determined from the time of treatment to death or date of last follow up. The Kaplan-Meier method was used to estimate the survival rates and the differences were compared with log-rank test. A *p*-values significant level of probability was considered as less than 0.05. The statistical analyses were done with SPSS 15.0 for Windows (SPSS Inc., Chicago, IL, USA). Chi-square test was used to examine differences where appropriate.

## Results

Eighty-nine patients under went laparoscopic assisted right hemicolectomy during January 1999 to December 2008. During the same period, eighty-five additional patients matching in age, gender, BMI, ASA status and pathologic staging underwent open right hemicolectomy were selected in the control group. The clinical and demographic data for the two groups are shown in Table 1. Four patients converted

from laparoscopy to open method due to massive bleeding that can't be managed well under laparoscopy. The conversion rate was 4.5% (4/89). The mean age of both groups were 65.75 years old in laparoscopy group (Range 91 to 26 years old) and 67.78 years old in open group (Range 89 to 31 years old). The mean BMI were 23.85 in laparoscopy group (Range 33.91 to 16.73) and 23.59 in open group (Range 30.33 to 17.57). The majority of the patients were ASA class 2 and 3. Tumor location were mostly in ascending colon. The cancer staging were mostly stage II (Scopy: 43.5%, Open: 42.4%) and stage III (Scopy: 32.9%, Open: 35.3%) in each groups.

Patients who underwent laparoscopic resections require significantly longer operation time than open

methods (208 min vs. 162 min,  $p = 0.036$ ) but suffer less blood loss (93 ml vs. 210 ml,  $p = 0.06$ ). There were no significant differences in the number of lymph nodes harvested for cancer resections (Scopy: 24 vs. Open: 22) (Table 2). Comparing post-operative recovery, the laparoscopic group had a shorter time for day of first bowel movement (2.41 days vs. 2.76 days,  $p = 0.027$ ) and oral intake (1.66 days vs. 2.08 days,  $p = 0.019$ ). In addition, the laparoscopic group had fewer days in the hospital than the open group (7.33 days vs. 11.44 days,  $p = 0.131$ ). Finally, the complication rate was lower in the laparoscopic group than in the open group (8.2% vs. 17.6%,  $p = 0.068$ ) (Table 2). Comparing the 5-year survival rate for all stages, both groups are similar (Scopy: 67.9% vs.

**Table 1.** Demographic data of the patients underwent surgery

	Laparoscopy assisted right hemicolectomy (n = 85)	Open right hemicolectomy (n = 85)	<i>p</i>
Age	65.8 ± 12.76 (26-91)	67.8 ± 11.25 (31-89)	0.525
Gender(M/F)	39/46	44/41	0.443
BMI	23.9 ± 3.78 (16.73-33.91)	23.6 ± 3.10 (17.57-30.33)	0.242
Tumor location			0.694
Cecum	15	11	
A colon	45	50	
Hepatic flexure	12	9	
T colon	13	15	
ASA score of patients underwent surgery			0.057
I	6	2	
II	38	33	
III	41	45	
IV	0	5	
Tumor staging			0.940
0	2	3	
I	18	16	
II	37	36	
III	28	30	

ASA: The American Association of Anaesthetists.

**Table 2.** Operative and post operative variables of patients underwent surgery

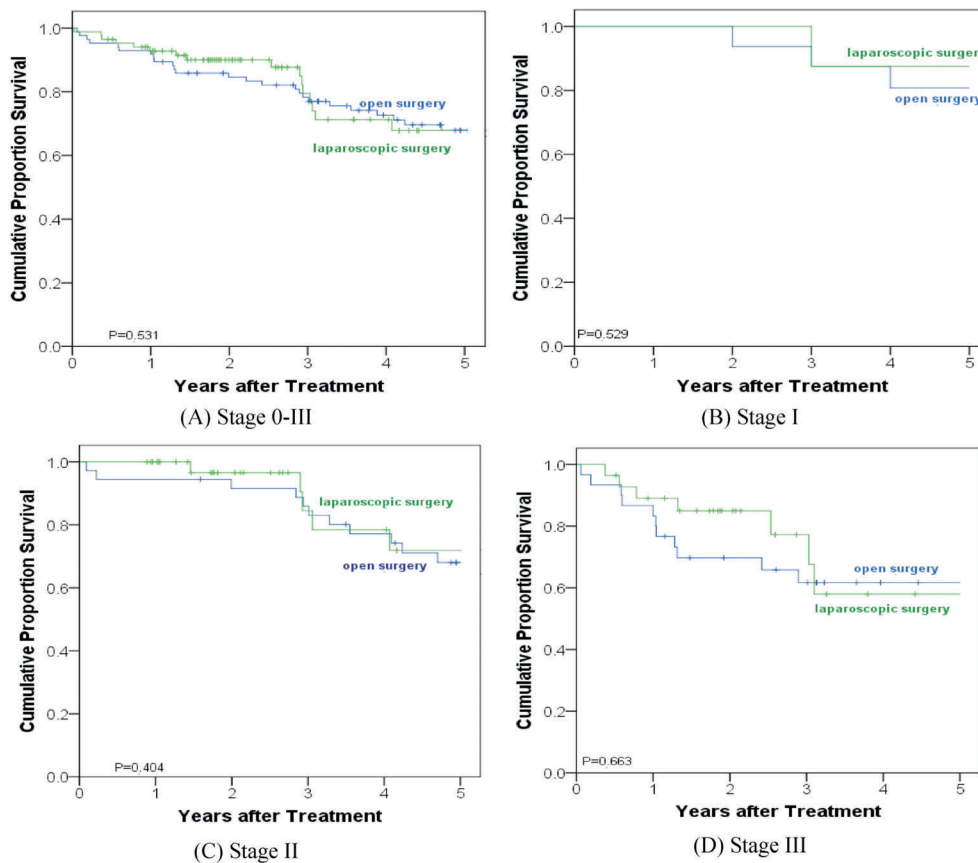
	Laparoscopy assisted right hemicolectomy	Open right hemicolectomy	<i>p</i>
Operation time (min)	208.0 ± 66.55 (100-490)	161.75 ± 64.33 (70-505)	0.036
Blood loss (ml)	93.41 ± 105.46 (10-500)	209.94 ± 291.01 (10-1500)	0.060
Lymph nodes harvested	24.11 (6-75)	22.21 (3-60)	0.427
First day for bowel movement (day)	2.41 ± 1.05 (1-11)	2.76 ± 0.92 (1-6)	0.027
First day for oral intake (day)	1.66 ± 1.20 (1-11)	2.08 ± 1.18 (1-7)	0.019
Length of hospitalization (day)	7.33 ± 2.83 (3-22)	11.44 ± 9.65 (5-68)	0.131
Complication rate (%)	8.2	17.6	0.068

Open: 67.9%,  $p = 0.531$ ). In comparing stage I patients, no significant differences were noted in either groups (Scopy: 87.5% vs. Open: 80.2%,  $p = 0.529$ ). Comparing stage II patients, again, there were no significant differences between both groups (Scopy: 73.5% vs. Open: 67.5%,  $p = 0.404$ ). The same result was noted in stage III patients (Scopy: 57.9% vs. Open: 61.7%,  $p = 0.663$ ) (Fig. 1). The same result can be seen in the 5-year disease free survival rate for all stages. (Scopy: 63.7% vs. Open: 57.7%,  $p = 0.406$ ). In stage I patients, there were no significant difference between both groups (Scopy: 71.4.% vs. Open: 80.2%,  $p = 0.502$ ). In stage II patients, there were also no significant difference between groups (Scopy: 74.5.% vs. Open: 65.2%,  $p = 0.272$ ). Comparing the stage III patients, there were also no significant difference in both groups (Scopy: 55.6.% vs. Open: 58.4%,  $p = 0.610$ ) (Fig. 2). Local recurrent rate was 1.18% in scopy group (1/85) and 3.53% (3/85) in open group (Table 2). No significant difference was noted between both groups.

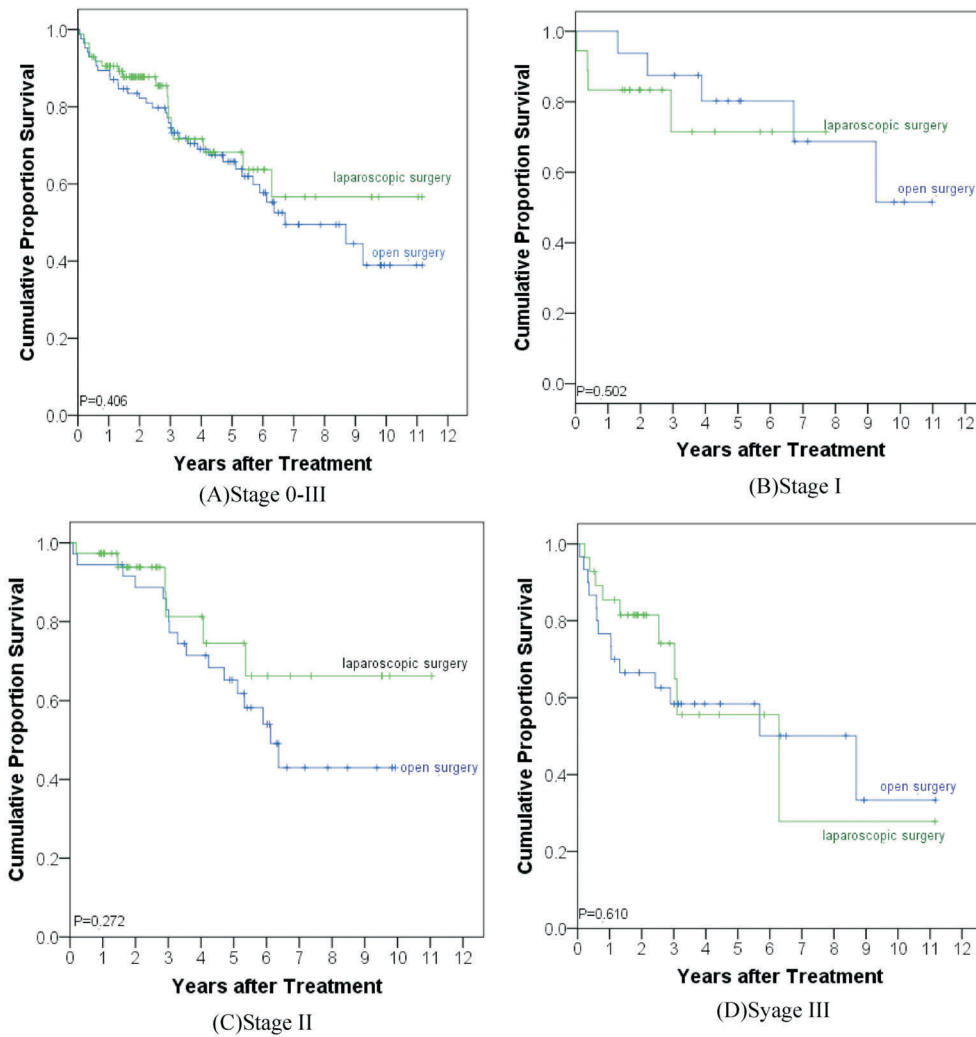
## Discussion

Although adjuvant chemotherapy can improve survival of these patients suffered colorectal cancer, resection of the malignant tumor remains the only curative therapy. The surgical technique to resect colon cancer has undergone significant changes in the past decades.<sup>14</sup> The greatest advantage of laparoscopic surgery in comparison with open surgery is reduction of tissue trauma. Access to the peritoneal cavity is established through small incisions, manual retraction of viscera is avoided, and blood loss is minimal because of meticulous dissection facilitated by videoscopic magnification. Bouvy et al.<sup>15</sup> showed in an experimental study that laparoscopic surgery was associated with less tumor recurrence than open surgery.

Supporting evidence of the beneficial oncological role of laparoscopic assisted colectomy include its impact on surgical stress response, cellular immunity, cytokine release, intraoperative tumor manipulation, complication rate, and blood transfusion factors. The



**Fig. 1.** 5-year overall survival rate.



**Fig. 2.** 5-year disease free survival rate.

stress response after colorectal surgery for cancer is less pronounced and consequently results in better preservation of the early postoperative cellular immune function and attenuated disturbance of inflammatory mediators when the laparoscopic approach is chosen.<sup>16,17</sup>

The operative variables such as operative time, blood loss, lymph node harvested were compared in both groups. The mean operative time in our laparoscopic group was 208 min. In other series, the mean operative time ranges from 107 min to 207 min. In addition, the mean operative time in open group was 161 min. It was a little longer than other series.<sup>18-25</sup> (Table 3) Laparoscopic surgery takes significant longer time than open surgery in our series. There are some reasons about longer time for laparoscopic sur-

gery. One is that laparoscopic surgery needs longer learning curve for beginners. It is because laparoscopic surgeons need to change the familiar territory of a three-dimensional operating field to a two-dimensional flat video display. It also requires some degree of practice moving around long laparoscopic instruments while handling delicate tissues. Other reasons such as longer time for pre-operative setting should also be considered. Operative variables include day for first bowel movement, day for starting oral intake, length of hospitalization and complication rate. As mentioned previously, laparoscopic surgery can fasten the recovery of bowel movement thus decrease the length of hospitalization. In our series, the mean time of first time bowel movement in laparoscopic group was 2.41 days. It was similar to other series.<sup>20-23,25</sup>

**Table 3.** Operative time (minutes)

	Laparoscopy assisted right hemicolectomy	Open right hemicolectomy	<i>p</i>
Leung et al. (1999) <sup>18</sup>	191.8 (mean)	148.6 (mean)	< 0.001
Baker et al. (2004) <sup>19</sup>	107.2 (mean)	97.4 (mean)	0.155 (NS)
Zheng et al. (2005) <sup>20</sup>	152.65 (mean)	147.25 (mean)	0.562 (NS)
Lohsiriwat et al. (2007) <sup>21</sup>	207.7 (mean)	104.5 (mean)	< 0.001
Tong et al. (2007) <sup>22</sup>	165 (mean)	115 (mean)	< 0.001
Braga et al. (2007) <sup>23</sup>	131 (mean)	112 (mean)	0.01
Chung et al. (2007) <sup>24</sup>	110 (median)	97.5 (median)	0.003
Ng et al. (2008) <sup>25</sup>	187.5 (median)	145 (median)	0.034

NS: not significant.

**Table 4.** Day for first bowel movement

	Laparoscopy assisted right hemicolectomy	Open right hemicolectomy	<i>p</i>
Zheng et al. (2005) <sup>20</sup>	2.24 (mean)	3.25 (mean)	0.012
Lohsiriwat et al. (2007) <sup>21</sup>	3.2 (mean)	3.7 (mean)	0.25 (NS)
Tong et al. (2007) <sup>22</sup>	4 (median)	4 (median)	NS
Chung et al. (2007) <sup>23</sup>	2 (median)	3 (median)	0.003
Ng et al. (2008) <sup>25</sup>	5 (median)	5 (median)	0.645 (NS)

NS: not significant.

(Table 4). In the open group, the time was significantly longer, (2.76 days). The same result can be seen in the first day for oral intake. Although there were no significant differences between length of hospitalization and complication rates, the laparoscopic group tended to have a shorter hospital stay and a lower complication rate than the open group.

The most important concern is whether laparoscopic surgery can provide the same oncologic outcome as other procedures. In our series, there were no significant differences in lymph nodes harvested during the operation. Indeed, the overall 5-year survival rates for both groups were almost identical ( $p = 0.531$ ). Comparing the 5-year disease-free survival rates, there were no significant difference between two groups ( $p = 0.406$ ). The result above indicates that the procedure can be performed successfully and will lead to adequate oncological clearance.

There are some limitations to this study. One is that these operations were performed by different surgeons. Although all of them were qualified surgeons, there were also some differences. Some were experienced senior surgeons and some were less experienced junior surgeons. The other is that all of the lymph nodes harvested from the operation were not

examined by the same pathologists. This study is also limited by the small sample of patients. The results of our study will need to be confirmed in a multi-institutional survey involving a wide array of patients.

## Conclusion

Based on our study, laparoscopic assisted right hemicolectomy can offer similar oncologic outcomes compared to open right hemicolectomy. Furthermore, this procedure entails a shorter hospital stay, less blood loss, and early recovery of bowel function.

## References

1. Reza MM, Blasco JA, Andradas E, et al. Systematic review of laparoscopic versus open surgery for colorectal cancer. *Br J Surg* 2006;93:921-8.
2. Abraham NS, Byrne CM, Young JM, et al. Meta-analysis of non-randomized comparative studies of the short-term outcomes of laparoscopic resection for colorectal cancer. *ANZ J Surg* 2007;77:508-16.
3. Abraham NS, Young JM, Solomon MJ. Meta-analysis of short-term outcomes after laparoscopic resection for colorectal cancer. *Br J Surg* 2004;91:1111-24.

4. Schwandner O, Schiedeck TH, Killaitis C, et al. A case-control-study comparing laparoscopic versus open surgery for rectosigmoidal and rectal cancer. *Int J Colorectal Dis* 1999;14:158-63.
5. Falk PM, Beart RW Jr, Wexner SD, et al. Laparoscopic colectomy: a critical appraisal. *Dis Colon Rectum* 1993;36:28-34.
6. Veldkamp R, Kuhry E, Hop WC, et al. Laparoscopic surgery versus open surgery for colon cancer: short-term outcomes of a randomised trial. *Lancet Oncol* 2005;6:477-84.
7. Wright RC, Kim CA, Horner I, et al. Superior lymph node resection is achievable with laparoscopic colectomy: even in initial 30 cases. *Am Surg* 2008;74:243-9.
8. Hartley JE, Mehigan BJ, MacDonald AW, et al. Patterns of recurrence and survival after laparoscopic and conventional resections for colorectal carcinoma. *Ann Surg* 2000;232:181-6.
9. Sample CB, Watson M, Okrainec A, et al. Long-term outcomes of laparoscopic surgery for colorectal cancer. *Surg Endosc* 2006;20:30-4.
10. Nakamura T, Mitomi H, Ohtani Y, et al. Comparison of long-term outcome of laparoscopic and conventional surgery for advanced colon and rectosigmoid cancer. *Hepatogastroenterology* 2006;53:351-3.
11. Jayne DG, Guillou PJ, Thorpe H, et al. Randomized trial of laparoscopic-assisted resection of colorectal carcinoma: 3-year results of the UK MRC CLASICC Trial Group. *J Clin Oncol* 2007;25:3061-8.
12. Tinmouth J, Tomlinson G. Laparoscopically assisted versus open colectomy for colon cancer. *N Engl J Med* 2004;351:933-4.
13. American Joint Committee on Cancer. AJCC cancer staging manual, 6th edn. 2002. Springer, New York.
14. Transatlantic Laparoscopically Assisted vs. Open Colectomy Trials Study Group. Laparoscopically Assisted vs. Open Colectomy for Colon Cancer, A Meta-analysis. *Arch Surg* 2007;142:298-303.
15. Bouvy ND, Marquet RL, Jeekel J, Bonjer HJ. Impact of gas (less) laparoscopy and laparotomy on peritoneal tumor growth and abdominal wall metastases. *Ann Surg* 1996;224:694-701.
16. Cirocco WC, Schwartzman A, Golub RW. Abdominal wall recurrence after laparoscopic colectomy for colon cancer. *Surgery* 1994;116:842-6.
17. Berman IR. Laparoscopic resection for colon cancer: cause for pause. *Important Adv Oncol* 1996;231-43.
18. Leung KL, Meng WC, Lee JF, et al. Laparoscopic-assisted resection of right-sided colonic carcinoma: a case-control study. *J Surg Oncol* 1999;71:97-100.
19. Baker RP, Titu LV, Hartley JE, et al. A case-control study of laparoscopic right hemicolectomy vs. open right hemicolectomy. *Dis Colon Rectum* 2004;47:1675-9.
20. Zheng MH, Feng B, Lu AG, et al. Laparoscopic versus open right hemicolectomy with curative intent for colon carcinoma. *World J Gastroenterol* 2005;11:323-6.
21. Lohsiriwat V, Lohsiriwat D, Chinswangwatanakul V, et al. Comparison of short-term outcomes between laparoscopically assisted vs. transverse-incision open right hemicolectomy for right-sided colon cancer: a retrospective study. *World J Surg Oncol* 2007;5:49.
22. Tong DK, Law WL. Laparoscopic versus open right hemicolectomy for carcinoma of the colon. *Jsls* 2007;11:76-80.
23. Braga M, Frasson M, Vignali A, et al. Open right colectomy is still effective compared to laparoscopy: results of a randomized trial. *Ann Surg* 2007;246:1010-4 discussion 1014-5.
24. Chung CC, Ng DC, Tsang WW, et al. Hand-assisted laparoscopic versus open right colectomy: a randomized controlled trial. *Ann Surg* 2007;246:728-33.
25. Ng SS, Lee JF, Yiu RY, et al. Emergency laparoscopic assisted versus open right hemicolectomy for obstructing rightsided colonic carcinoma: a comparative study of short-term clinical outcomes. *World J Surg* 2008;32:454-8.

## 病例分析

# 腹腔鏡輔助右側大腸切除術 — 彰化基督教醫院 10 年經驗

陳成賢 陳宏彰 尤昭傑 林倉祺 黃玄遠 黃燈明

彰化基督教醫院 外科部 大腸直腸外科

**目的** 腹腔鏡手術已是近年來的潮流，我們在此次研究中分析本院 10 年間腹腔鏡輔助右側大腸切除術的成果。

**方法** 本研究是採取回溯性分析。分析本院自 1999 年 1 月至 2008 年 12 月間接受腹腔鏡輔助右側大腸切除術的患者，共 89 位。同時時間內比較 85 名接受傳統右側大腸切除術的患者做對照組。

**結果** 接受腹腔鏡手術的患者，手術時間明顯比傳統手術為長 (208 min vs. 162 min,  $p = 0.036$ )，但是出血量是明顯較少 (93 ml vs. 210 ml,  $p = 0.06$ )。在淋巴結廓清上，兩者並無顯著差異 (24 vs. 22,  $p = 0.427$ )。接受腹腔鏡手術的組別在術後有明顯較短的首次恢復腸蠕動的時間 (2.41 days vs. 2.76 days,  $p = 0.027$ ) 及由口進食的時間 (1.66 days vs. 2.08 days,  $p = 0.019$ )。此外，接受腹腔鏡手術的患者有較短的住院天數 (7.33 days vs. 11.44 days,  $p = 0.131$ ) 及低併發症發生率 (.2% vs. 17.6%,  $p = 0.068$ )。轉換術式的比例為 4.5% (4/89)。比較兩組的五年存活率，兩種術式是相似的 (67.9% vs. Open: 67.9%,  $p = 0.531$ )。以各期別來看，結果亦然。第一期：87.5% vs. 80.2% ( $p = 0.529$ )。第二期：73.5% vs. 67.5% ( $p = 0.404$ )。第三期：57.9% vs. 61.7% ( $p = 0.663$ )。比較兩組的五年無病存活率，兩種術式是相似的 (68.3% vs. Open: 65.8%,  $p = 0.405$ )。以各期別來看，結果亦然。第一期：71.4% vs. 80.2% ( $p = 0.502$ )。第二期：74.5% vs. 65.2% ( $p = 0.272$ )。第三期：55.6% vs. 58.4% ( $p = 0.610$ )。接受腹腔鏡手術的組別，局部復發率為 1.18%，而傳統手術組則為 3.53%。

**結論** 根據我們的經驗，腹腔鏡輔助右側大腸切除術是個安全而且適當的手術。

**關鍵詞** 腹腔鏡手術、右側大腸切除術、大腸癌。