

SINGLE PORT LAPAROSCOPY IN TREATMENT OF COLON CANCER: EXPERIENCE ON 65 CONSECUTIVE CASES

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ABSTRACT

Background: In single port (SP) laparoscopy for treatment of colon cancer, the single port site is also the place for extraction specimen. This makes the technique having a huge attraction. However, this is a difficult technique requiring good skill and experience of surgeons.

This study aimed to evaluate the feasibility, safety, and the early results of this technique.

Method: A prospective study on colon cancer patients who were operated by SP laparoscopic colectomy from 10.2010 to 10.2014.

Criteria for inclusion consisted of tumor size ≤ 8 cm, BMI under 25kg/m^2 , no invasive to adjacent organs and distant metastasis based, ASA 1-3, no intestinal occlusion or sub-occlusion.

A single port (SILS™; Covidien), optique 30° (5 and 10 mm) and standard laparoscopic graspers with different length were used. The single port was placed through a vertical incision about 2.5-3 cm at umbilicus.

Results: 65 consecutive patients with mean age: 58.2 ± 14.5 years, male 38. BMI: $22.4 \pm 2.7\text{kg/m}^2$. Tumor size: $3.7 \pm 2.4\text{cm}$. Procedures: 58 right hemicolectomies (89.2%), five left hemicolectomy and two anterior resection. Five cases needed one additional port. Conversions to open surgery: 7 cases. TNM classification: stage I: 4, stage IIa: 36, stage IIIa: 25 cases. Operating time: 165.4 ± 75.4 minutes. No death and intraoperative complication. Incision length: $5.2 \pm 2.8\text{cm}$. Hospital stay: $7.8 \pm 6.3\text{d}$, wound infection 4 (6.8%) cases and one case reoperation due to anastomotic leakage (1.7%). The median follow-up time was 31.5 months. All patients survived at the end of this study. There were no incisional hernia, incisional metastasis and lung metastasis. There were 22 patients having high postoperative CEA, 2 liver metastasis and 5 local recurrence.

Conclusion: Single port laparoscopic colectomy in colon cancer treatment is feasible, safe. The short incision is hidden by umbilicus. Other surgical and oncological results were similar to that of traditional laparoscopy.

Key word: Single port, laparoscopic colectomy.

I. INTRODUCTION

Single port (SP) laparoscopic surgery is a new method that allows the surgeon to operate intra-abdominally through a small incision only, especially through the umbilicus [1]. In SP laparoscopy for treatment of colon cancer, the single port site was also the place for specimen extraction. This makes this technique. However, this is a difficult technique requiring good skill and experience of surgeons.

The development of techniques, accumulation

of experience and the widespread use of dissection instruments (harmonic scalpel, Ligasure) and mechanic anastomosis devices (GIA, EEA) made SP laparoscopy being applied widely [1], [2].

The successful application of SP laparoscopy in treatment of colorectal cancer in a few centers in the world has prompted us to study the application of this procedure in our facility.

This study aimed to evaluate the feasibility, safety, and the early results of this technique.

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II. MATERIALS AND METHODS

2.1. Materials

The colon cancer patients treated with SP laparoscopic surgery

- Criteria for inclusion:

+ Patients diagnosed with colon cancer based on the results of endoscopic biopsy.

+ The tumor size ≤ 8 cm, no invasive to adjacent organs and distant metastasis based on CT scan and X-ray.

+ ASA 1-3

+ Body Mass Index (BMI) < 25 kg/m²

+ Patients not in situation of intestinal occlusion or sub-occlusion.

+ Patient's consent.

- Criteria for exclusion:

+ pregnancy

+ Previous midline abdominal scar

2.2. Methods:

- This is a prospective study.

- Surgical technique:

+ Instruments: a single access port (SILSTM; Covidien, Mansfield, MA, US), optique 30°, 10 mm; optique 30°, 5.5 mm, 50 cm and standard laparoscopic graspers were used.

+ The surgical technique was similar to that of traditional laparoscopic colectomy, except for a single access port was used through a vertical incision about 2.5-3 cm at umbilicus instead of 4-5 traditional ports. When the vessel was too big, required hemolock 10 mm, Optique 10 mm was replaced by optique 5 mm. In some cases, instrument conflict was the main reason causing the difficult in dissection, optique 5 mm was used also. If the difficulty of dissection still presented, after 30 minutes, one port of 5 mm was needed. And

then if after one hour there was no progression, the operation was converted to open.

+ The specimen was taken out through the single port incision protected by a nylon bag. The incision was enlarged on both side in case of big tumor. The anastomosis was done extra-abdominally.

+ The single access port was replaced to control the abdominal before closure. Drain was used in case of intra-abdominal fluid residual suspected.

- Data collection:

+ General characteristics of patients, tumor size on CT scan, surgical procedures, conversion rate, reason of conversion.

+ Complications during and after surgery, the results of surgery, hospital stay were collected in the group without conversion.

- Stage evaluation based on TNM classification.

- Follow-up patients consist of physical examination, Carcino embrionary antigen (CEA) dosage, abdominal ultrasound, chest X-ray at first, 3th, 6th, 12th, 24th and 48th month. From 3th month abdominal CT scan was given and colonoscopy was done from 6th month. CEA ≥ 5 ng/ml was considered high.

- Statistical analysis: Excel was used to calculate mean value, standard deviation for parametric data, median value for follow-up time.

III. RESULTS

Between October 2010 and October 2014, 75 consecutive patients with colon cancer were operated by SP laparoscopy. Ten cases had tumor invasion to adjacent organs discovered after placement of the SP and they were excluded from the study. So, the data of 65 cases were analyzed. The patient's demography was described in table 1:

Table 1: Patient's demography

	n	%
Male/Female:	38/27	1.4/1
Mean age:	58.2 \pm 14.5	
Min	25	
Max	81	
Body mass index (Kg/m ²)	22.4 \pm 2.7	
Adenocarcinoma	75	100
Tumor size	3.7 \pm 2.4	
Min	3	
Max	8	
CEA (ng/ml)		
< 5	28	43.1
≥ 5	37	56.9

There were 58 (89.2%) right hemicolectomy and seven (10.7%) left colectomy which consisted of five left hemicolectomy and two anterior resection. The technique changes occurred in 12 cases (18,5%) in which 5 cases needed one more port and 7 cases required conversion to open surgery. The detail of technique changes was displayed in table 2:

Table 2: Technique changes

Technique changes	n	%
Additional port	5	7.7
Right colon	4	6.1
Left colon	1	1.5
Open conversion	7	10.7
Right colon	7	10.7
Left colon	0	0

The mean tumor size of 7 converted cases was 6.2 ± 1 (5-8) cm.

The following results were analyzed on 58 unconverted cases.

There was no death. No intraoperative complication was found. The Operating time was 165.4 ± 75.4 (range from 145 to 290) minutes. Five cases were placed drain (all in cases of one more port needed). The incisional length was measured 5.2 ± 2.8 (range from 4 to 10) cm. Post-operative results were showed in table 3.

Table 3: Post-Operative results

	Min	Max	Mean
Postoperative pain (days)	2	6	4.2 ± 2.8
Bowel movement return (days)	2	5	3.8 ± 1.4
Hospital stay(days)	6	16	7.8 ± 6.3
Incisional infection	n = 4		6.8%
Anastomotic leakage	n = 1		1.7%

The anastomotic leakage was of right hemicolectomy and required re-operation.

Evaluation of post-operative stage comprised: 4 cases in stage 1, 36 in stage 2a, 25 in stage 3a.

The median follow-up time was 31.5 months. All patients survived at the end of this study. There were no incisional hernia, incisional metastasis

and lung metastasis. There were 22(37.9) patients who had high postoperative CEA, 2(3.4) liver metastasis (LM) and 5 (8.6) local recurrence (LR). The accumulative number of the patients on follow-up were showed on chart 1.

Patients

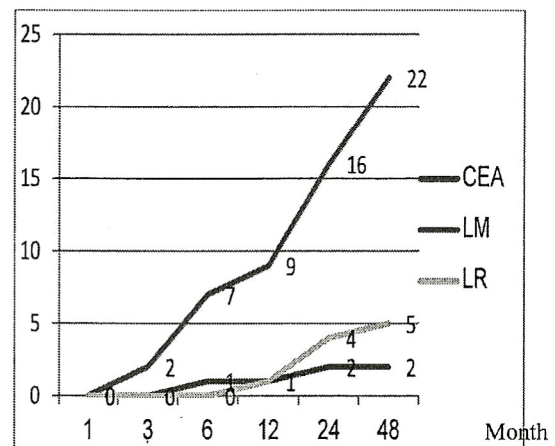


Chart 1: Follow-up results

IV. DISCUSSION

Among sixty five patients with colon cancer who had operated, we found five cases needed one additional port and 7 conversions to open. Operative results showed no death, no intraoperative complications, one case of anastomotic leakage and 4 incisional infections. The study have showed that SP laparoscopy in treatment of colon cancer to be feasible and safe.

SP Laparoscopy for treatment of colorectal cancer is a difficult technique that require good skill and experience of surgeons. To over come the challenges of SP laparoscopy, we combined some tactics such as using small long optique and improvement of dissection technique. Instruments come in three configurations: standard, articulating, and pre-bent rigid. We chose standard instruments which were familiar due to frequent in our service over 20 years and the SILS device from Covidien is flexible to be able to provide surgeons with maneuverability. On the other hand, standard instruments are significantly cheaper than articulating instruments. In our study, 5 mm-50 cm long optique was used in difficult cases to minimize

instrument clashing and provide better working space. We always performed two instruments crossed-overt to have good traction in dissection. Other authors also showed that SP laparoscopy in the colectomy could be done with conventional laparoscopic instruments[3][4].

To increase the success rate of SP laparoscopy we chose the patients with BMI under 25 kg/m^2 . The average BMI in our study was $22.6 \pm 2.9 \text{ kg/m}^2$. We all know that the fatter patients have in mesenteric, the more difficult laparoscopy [5] is when used in them. And this is one of the factors that led to convert from laparoscopy to open surgery [6]. This influence is especially evident in SP laparoscopy. Indeed, study of Diego I showed that conversion rate found higher in group with BMI over 25 kg/m^2 than in the group with BMI less than 25 kg/m^2 [7]. Other studies of SP laparoscopy had relatively low in BMI, such as in meta-analysis study of Makino et al, BMI was 25.5 kg/m^2 [8], in meta-analysis study of Fung et al was 25.8 kg/m^2 [9]. Even randomized comparative study of Chen W.T. et al, BMI was 23.3 kg/m^2 [10].

Our selection of patients with tumor size $\leq 8 \text{ cm}$ tumor size on CT scan based on some other studies[10][11]. Mean tumor size in our study was $3.9 \pm 2.8 (2-8) \text{ cm}$. The technique changes occurred in 12 cases in which 5 cases needed one more port and 7 cases required conversion to open surgery (table 2). We placed one more 5 minutes port after 30 minutes if there were difficulties in dissection, and converted to open surgery after one hour if there were not any progression in vascular dissection. This is half of our operating time in standard laparoscopic right hemicolectomy [12]. We identified that the larger the tumor was, the more difficult vascular dissection was. The mean tumor size of 7 converted cases was $6.2 \pm 1 (5-8) \text{ cm}$. The conversion rate in our study was higher than that of several other studies[10][11]. According to us, the reason was some right colon tumors with big size making vascular dissection difficult.

Our operating time was 165.4 ± 75.4 (range from 145 to 290) minutes. It was longer than standard

laparoscopic colectomy[10][11][12]. Compare with other authors using SP laparoscopy for colon cancer, our operating time was also longer [11][13][14]. Another factor related to SP laparoscopy in colon cancer treatment is surgical procedure. Most authors recognized that left hemicolectomy or sigmoid resection which required dissection in the pelvis and free the splenic flexure made SP laparoscopy becoming very difficult[3,4,8,9,15]. In our study we have 5 left hemicolectomy (6.6%) and 2 anterior resection (2.6%), but in the study of Papaconstantinou [11], there was no left hemicolectomy. Related to Huscher[13], the shorter operating time in SP laparoscopic group may be related to the high incidence of cancer stage 1 and 2 (12/16), but there were 25 cases of stage 3a in our study.

In our study, the average incision length was $5.2 \pm 2.8 \text{ cm}$ (4-10cm). It was longer than several other studies [10][16]. Our incision was longer because several tumors in our study were big in size, so we had to extend the incision to get these tumors out.

Our study had five cases of complications, including 4 cases of wound infection and one case of anastomotic leakage required re-intervention. It was similar to other authors[10][16][17].

Our other results such as post-operative pain, bowel movement return, length of hospital stay were similar to the results of traditional laparoscopic surgery [12]. Until recently, all four studies comparing SP laparoscopy with traditional laparoscopy showed that SP laparoscopy was feasible and safe in terms of technical as well as oncology. However, these studies have had yet to see any other outstanding advantages of SP laparoscopy versus conventional laparoscopic, except aesthetically [10],[11],[13],[18]. Only a comparative study of Poon J.T. et al on 50 patients recorded SP laparoscopy was less postoperative pain and shorter hospitalization time, however, the authors did not dare to affirm because the number of patients was small [18].

The median follow-up time was 31.5 months. All patients were survival at the end of our study. There

were no incisional hernia, incisional metastasis and lung metastasis. There were 22 patients(37.9%) having high postoperative CEA, 2(3.4) liver metastasis and 5(8.6) local recurrence. This was similar to the recognition of Papaconstantinou [11] and BoniL.[6].

V. CONCLUSION

Treatment of colon cancer by SP laparoscopy

is feasible and safe for all types of colectomy. In addition to the advantages of small incisions hidden by umbilicus making SP laparoscopy more aesthetic, other surgical outcomes were equivalent to traditional laparoscopy. However, a large number of patients is needed to be able to accurately assess the long-term results, particularly in terms of oncology

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