

## Comparison between the Fast Track Protocol for Laparoscopic Colorectal Surgery and Conventional Open Technique.

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### Abstract

Fast track protocol has been considered an excellent pathway for early recovery and minimizing hospital stay with significant decrease of complications rate. The aim of this study is to compare between the fast track protocol for laparoscopic colorectal surgery (LCS) and the classic open surgical technique. This prospective randomized study conducted at Ain Shams university hospitals over the course of two years from December 2010 till January 2013 and includes 40 patients with cancer colon 20 cases had laparoscopic assisted colectomy and 20 cases had open colectomy. Early follow up done within 7 weeks postoperative and late follow up done every 3 months. All patients in the study required resection of their tumours with intent to cure. The main measures of outcome are early recovery with pain controlled by oral analgesics, minimal hospital stay, early bowel function and decrease of postoperative complications and finally patient satisfaction. **Conclusion:** Implementation of the laparoscopic approach for colorectal carcinoma as a part of fast track protocol is an effective and safe way which promote early recovery and decrease hospital stay giving the synergistic advantages of both the fast track protocol and laproscopic surgery.

**Keywords:** Comparison between the fast track protocol and the conventional open technique for colorectal surgery

### Introduction

Various controlled prospective trials have demonstrated that laparoscopic surgery for colon cancer has short-term benefits such as less postoperative pain, a shorter hospital stay, and an earlier return to social life than with conventional open surgery.<sup>(1)</sup>

Initial criticism of laparoscopic colectomy focused on the longer operative time required for these procedures. This fact blemished by the beneficial economic advantage of shorter hospital stay observed in patients who underwent laparoscopic colectomy. With improvement of the instrumentation & refinement of technique, operative time has decreased<sup>(2)</sup>.

Fast track protocol for Laparoscopic colorectal surgery can decrease the stress response to surgery and so enhance recovery and decrease hospital stay. This can be implemented by multidisciplinary team providing preoperative, operative and postoperative procedures.

A significant variability in the components

of different fast-track protocols has also been reported<sup>(3)</sup>. Particularly, it is questioned whether all fast-track elements are of equal importance and which are the key factors that determine short-term clinical outcome in the fast-track setting<sup>(4)</sup>.

Randomized trials have now demonstrated the safety and efficacy of fast-track care in colorectal surgery, not only in reducing postoperative hospital stay and morbidity but also in improving patient convalescence and satisfaction when compared with traditional care<sup>(5)</sup>.

The aim of this study is to evaluate the efficacy of fast track protocol in laparoscopic colorectal surgery (LCS) when compared to the conventional open techniques in Ain shams university hospitals.

### Material and method

A written fast track protocol is made which is: A) Bowel preparation one day before surgery combined with antibiotics (1gm Neomycine and 1gm Metronidazole) B)

DVT prophylaxis (low molecular weight Heparin), C) General anaesthesia combined with epidural anaesthesia (in some cases), D) Minimally invasive technique (Laparoscopic hand assisted approach). E) Early ambulation. F) Chest and body physiotherapy. g) Early removal of the NGT and urinary catheter.

Inclusion criteria: 1) Patients set for elective colectomy for cancer colon. 2) The tumour must be resectable and operable. 3) Class 1 and 2 according to American Society of Anaesthesiologists (ASA) physical status classification system. 4) The patient must sign an informed consent to be included in the study.

Exclusion criteria: 1) Patients who need colectomy on emergency bases. 2) Non resectable & non operable mass. 3) Patients set for elective colectomy for inflammatory bowel diseases, familial polyposis or rectal cancers. 4) Patient's refusal to sign the informed consent. 5) Patients refusing laparoscopic surgery. 6) Presence of distant metastasis 7) Patients with previous laparotomy. 8) Patients with recurrent cancer colon. 9) Patients with contraindications for laparoscopic surgery as cardiac patients and patients with COPD. 10) Class 3 and 4 according to American Society of Anesthesiologists (ASA) physical status classification system and patients with general contraindications for surgical intervention. 11) Patients converted from laparoscopic colectomy to open due to any cause, as uncontrolled bleeding, injury of important structures or advanced tumours which were difficult to manage laparoscopically, were excluded from our study.

- Patients were divided into 2 groups:
  - ⇒ **Group A:** (20 patients) operated upon by open technique (with failure to implement the fast track protocol)
  - ⇒ **Group B:** (20 patients) operated upon by laparoscopic technique with implantation of the fast track protocol

The patient considered functionally recovered when the pain is well controlled on oral analgesics, mobilized out of bed and

on oral feeding.

### Surgical Technique

• The operations usually done by the team which is consists of a surgeon, first assistant, camera operator, and scrub nurse. Laparoscopic technique done by hand assisted technique and the open done through the conventional midline approach. For laparoscopy it was done through 3 ports and the specimens collected through Pfennig incision or left iliac fossa incision. For open surgery it was done through a midline incision.

Functional recovery was achieved when the patient has mild to moderate pain which is controlled by oral analgesics, fully mobilized, on oral feeding, open bowel and no ileus.

### **Results**

As regard **sex distribution** and special habits forty patients with operable cancer colon (22 females & 18 males), 17 of them are smokers, entered the final analysis (table 1) (figure 1).

The distribution of patients according to **cancer stage** according to TNM classification was 24 patients stage T 2 (60%), 10 patients stage T 3 (25.0%) and 1 patient stage T 4 (2.5%) (table 1) (figure 2).

According to **tumor site** 11 patients had tumour in the caecum (27.5%), 0 patients had tumor in ascending colon (0.0%), 0 patients had tumor in hepatic flexure (0.0%), 4 patients had tumor in splenic flexure (10.0%), 0 patients had tumor in sigmoid colon (0.0%), 0 patients had tumor in descending colon (0.0%) and 2 patients had tumor in transverse colon (5.0%) (table 1).

10 patients underwent open right hemicolectomy (25.0%), 0 patients underwent open left hemicolectomy (0.0%), 3 patients underwent open sigmoid colectomy (7.5%), 2 patients underwent open transverse colectomy (5.0%), 11 patients underwent laparoscopic right hemicolectomy (27.5%), 4 patients underwent laparoscopic left hemicolectomy (10.0%), 2 patients underwent laparoscopic sigmoid colectomy (5.0%) (table 1).

Table (1): Characteristics of patients

	N	%
<b>Sex</b>		
Female	23	57.0
Male	17	42.0
<b>Special Habits</b>		
Smoking	17	42.0
<b>Cancer stage(according to TNM classification)</b>		
T 1	24	60.0
T 2	10	24.0
T 3	1	2.0
<b>Tumor site</b>		
Caecum	11	27.0
Ascending colon	0	12.0
Hepatic flexure	0	12.0
Splenic flexure	7	17.0
Sigmoid colon	0	12.0
Descending colon	0	12.0
Transverse colon	2	5.0
<b>Operation</b>		
Open right hemicolectomy	10	25.0
Open left hemicolectomy	0	12.0
Open Sigmoid colectomy	3	7.0
Open transverse colectomy	2	5.0
Laparoscopic right hemicolectomy	11	27.0
Laparoscopic left hemicolectomy	7	17.0
Laparoscopic sigmoid colectomy	2	5.0

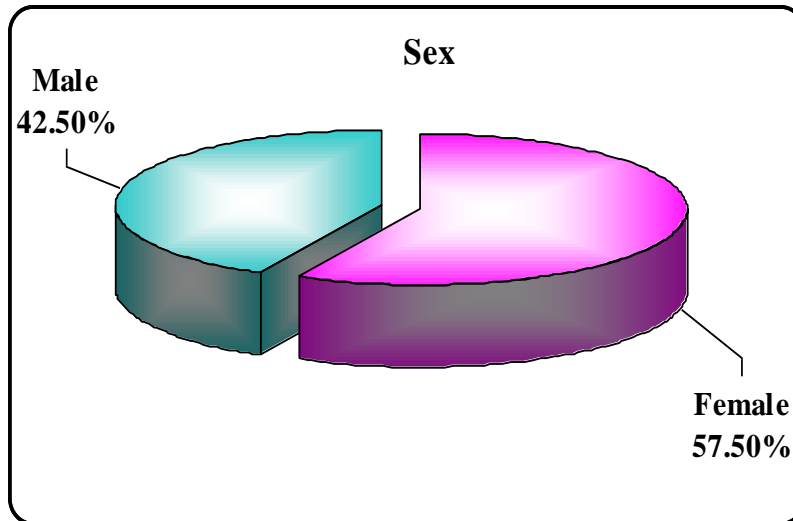


Figure (1): Sex distribution in both groups.

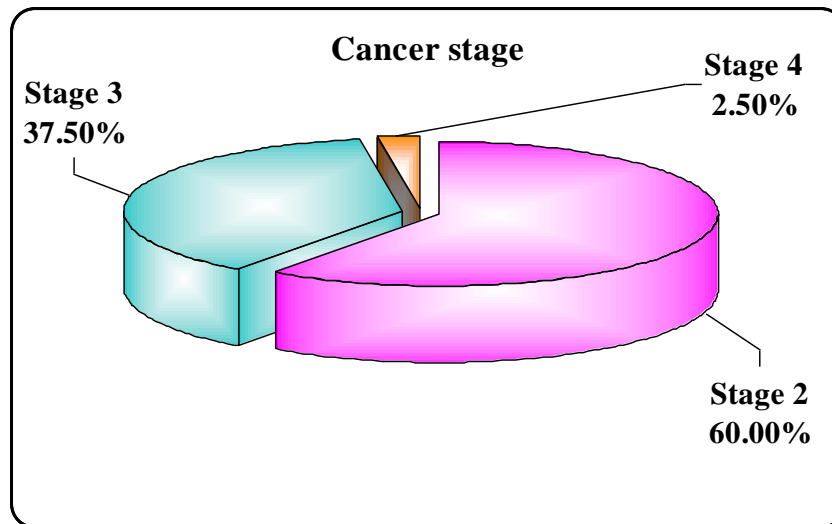


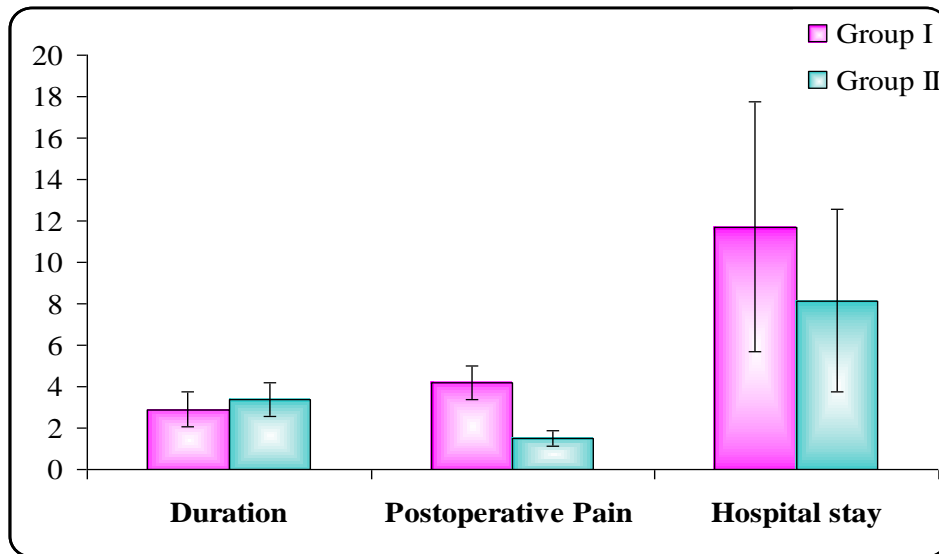
Figure (2): Cancer stage in both groups (according to TNM classification).

Regarding **postoperative pain**, patient with open colectomy group started oral analgesia after a mean of 4.2 days, while patients with fast track group started oral analgesia after a mean of 1.0 days, with presence of high statistically significant difference between the two groups ( $P < 0.001$ ) (table 2) (figure 3).

**Hospital stay** was of a mean of 11.2 days in open colectomy group, while was of a mean of 8.10 days in the fast track group, with presence of statistical significant difference between the two groups ( $P < 0.001$ ) (table 2) (figure 3).

**Table (2):** Statistical comparison between patients with different operations regarding mortality, blood transfusion, operative duration, postoperative pain and postoperative hospital stay.

	Groups				Tests	
	Group I		Group II		T or X <sup>2</sup>	P-value
	N	%	N	%		
<b>Mortality</b>	1	0.0	0	0.0	1.026	0.311 NS
<b>Blood transfusion</b>	1	0.0	0	0.0	1.026	0.311 NS
<b>Postoperative Pain (Time of start of oral analgesia "Days" )</b>						
Range	2-6		1-2		13.000	<0.001* HS
Mean±SD	4.2±0.8		1.0±0.4			
<b>Hospital stay</b>						
Range	7-26		4-23		2.131	*0.039 S
Mean±SD	11.7±6.02		8.10±4.39			



**Figure (3):** Duration, postoperative pain and hospital stay in both groups with standard deviation SD indicated by the lines in the middle of each column.

**Intra operative bleeding:**

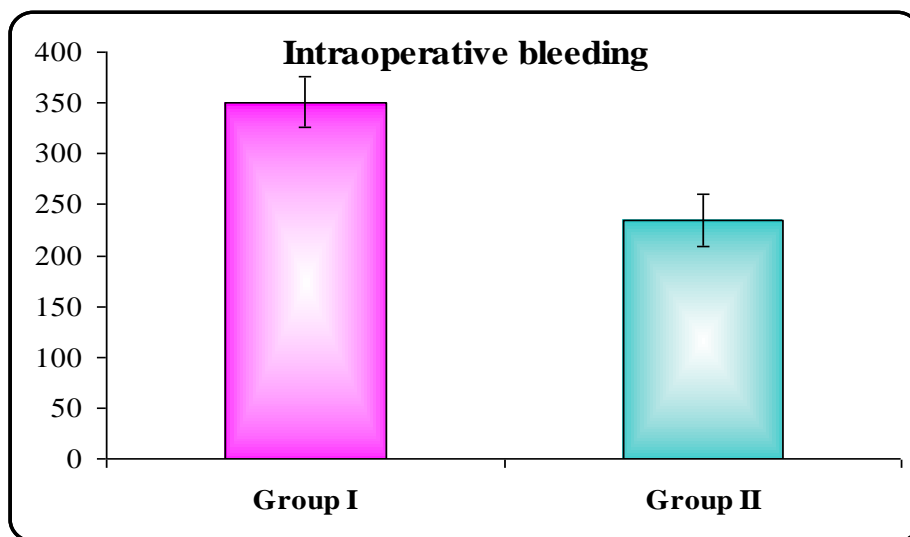
Regarding the mean for **intraoperative bleeding** as one of the intraoperative complications it was 301 CC with open colectomy group and 234.6 CC with fast track group. With high statistical significant difference between the two groups. ( $P < 0.001$ ) (table 3) (figure 4).

Two patients (10%) with open colectomy group had intra operative injury to important structures (spleen and left ureter),

splenic injury was severe for conservative management, so open splenectomy done in the first patient. While repair of the partial ureteric injury a ureteric stent was done in the second patient. One patient (0%) with fast track group had intraoperative injury to important structures (spleen). It was a minor tear in the lower splenic pole which was controlled by compression and electrocautery. With no statistical significant difference between the two groups ( $P > 0.05$ ) (table 3).

**Table (3):** Statistical comparison between patients with different operations regarding intra-operative complications.

	Groups							
	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
<b>Intraoperative bleeding</b>								
Range (in CC)	360-380		240-270				14.788	<0.001*
Mean ± SD	301 ± 24.3		234.6 ± 20.8					HS
<b>Injury to important structures</b>	2	10	1	0	3	7.0	0.229	0.722 NS



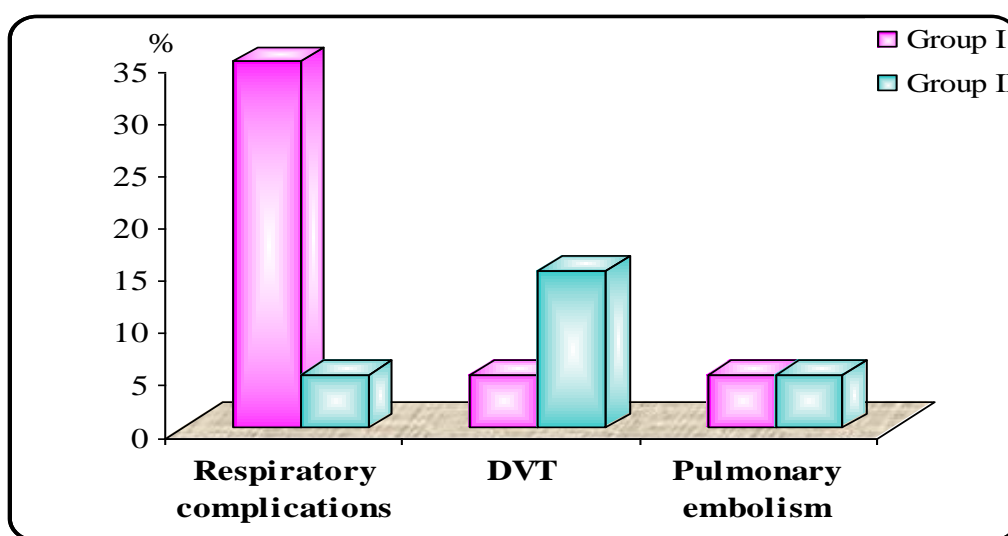
**Figure (4):** Intraoperative bleeding in Group I (open colectomy) and Group II (Fast Track group).

**Intraoperative blood transfusion** was needed in 1 patient (3%) with open colectomy, due to splenic injury in borderline anaemic patient. No patients with fast track group needed blood transfusion. With no statistical significant difference between the two groups ( $P > 0.05$ ).

**As regards the mortality rate** occurred in one patient (3%) with open colectomy, patient died in the ICU because of pulmonary embolism. No mortality encountered in patients with fast track group. With no statistical significant

difference between the two groups ( $P > 0.05$ ) (table 2).

Regarding respiratory status, 4 patients (30%) with open colectomy had **respiratory complications** after the operation, in form of chest infections in 2 patients, basal lung collapse in 1 patient and sympathetic left sided pleural effusion with underlying left lung collapse. While only 1 patient (3%) with fast track group had respiratory complication, in form of chest infection. With presence of statistical significant difference between the two groups ( $P < 0.05$ ) (table 4)(figure 3).



**Figure (3):** Respiratory complications in group I (open colectomy) and group II (Fast track group).

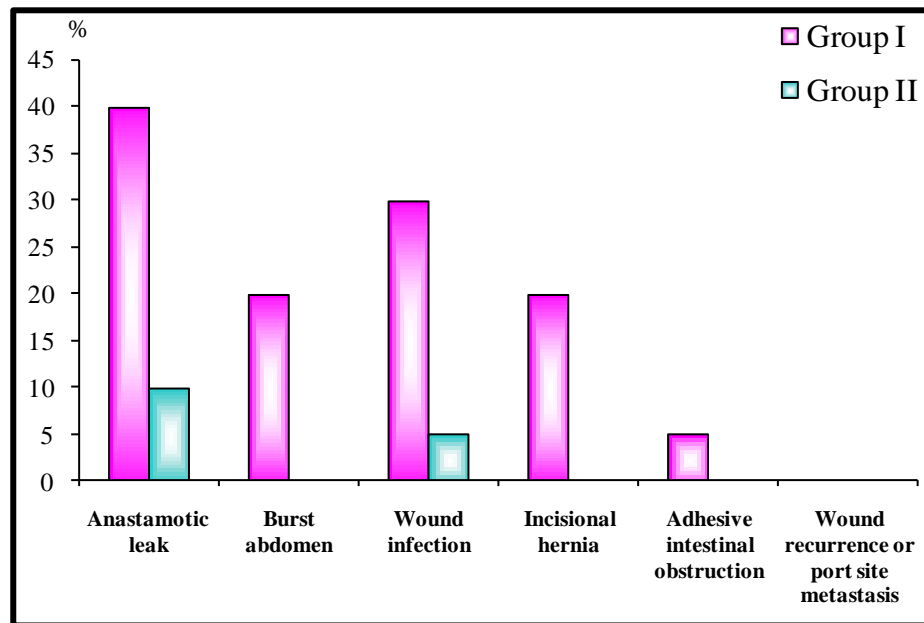
**Table (4):** Description of postoperative general complication in Group I (open colectomy) and Group II (laparoscopic colectomy).

	Groups							
	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
<b>Respiratory complications</b>	4	30.0	1	3.0	5	20.0	0.620	0.018* S
<b>DVT</b>	1	3.0	3	10.0	4	13.0	1.111	0.292 NS
<b>Pulmonary embolism</b>	1	3.0	1	3.0	2	6.0	0.000	1.000 NS

1 patient (0%) with open colectomy group had deep venous thrombosis, 3 patients (10%) with laparoscopic colectomy had deep venous thrombosis with no statistical significant difference between the two groups ( $P > 0.05$ ). (table 4) (figure 5)

Regarding the postoperative local complications 3 patients (10%) with open colectomy had **anastomotic breakdown**, in one of the -right hemicolectomy cases, leak

was minor & managed conservatively while the other one was transverse colectomy and the patient was re-explored after 10 days and transverse colostomy with mucous fistula were done. One patient (0%) from the fast track group with Laparoscopic colectomy - sigmoid colectomy- had minor anastomotic breakdown which was managed conservatively. With no statistical significant difference between the two groups ( $P > 0.05$ ) (table 5) (figure 6).



**Figure (6):** Postoperative local complications in group I (open colectomy) and group II (Fast track group)

**Wound dehiscence** occurred in 4 patients (10%) with open colectomy, none with the fast track group. With presence of statistical significant difference between the two groups ( $P < 0.05$ ) (table 6).

**Wound infection** occurred in 3 patients (10%) with open colectomy, while occurred in only one patient (0%) with the fast track group, occurred in Pfannenstiel wound which is the site of specimen exteriorization. With presence of statistical significant difference between the two groups. ( $P < 0.05$ ) (table 6).



**Table (5):** Description of postoperative local complications in Group I (open colectomy) and Group II (Fast track group).

	Groups							
	Group I		Group II		Total		Chi-square	
	N	%	N	%	N	%	X <sup>2</sup>	P-value
<b>Anastomotic breakdown</b>	2	10.0	1	5.0	3	20.0	0.360	0.048 NS
<b>Wound dehiscence</b>	4	20.0	0	0.0	4	10.0	4.444	0.030* S
<b>Wound infection</b>	6	30.0	1	5.0	7	17.0	4.329	0.037* S

### Discussion

Fast track protocol efficacy has been discussed in many literature and it has been proved that it decreases surgical stress, hospital stay and improves recovery without affection of the patient safety. Also laparoscopy is considered standard approach for colorectal surgery which also proved its efficacy in decreasing the hospital stay and improving recovery with no compromise. Each modality was studied separately in many literatures and showed its importance in minimizing surgical stress and helping early recovery. The difference here is the implementation of laparoscopic approach as a part of the fast track protocol and comparing it with the open technique, only for patient with malignant colon disease in Ain Shams university hospitals.

Our study showed that the fast track protocol combined with the laparoscopic surgery significantly reduced the post-operative surgical stress with early recovery and short hospital stay.

There was in our study statistical significant reduction of postoperative pain judged by the time patients needed to control their pain by oral analgesics between the open and fast track groups. In our study the mean time for starting use of oral analgesia was 4.2 days in open colectomy group and 1.0 days in laparoscopic colectomy group this difference shows the augmented effect of implantation of the laparoscopic approach as a part of the fast track protocol.

A Ehrlich and his colleagues showed that functional recovery for the fast track patients in complex colorectal surgeries was around 4 days<sup>(5)</sup>. In our study, the functional recovery time was 4.2 days for the fast track group compared to 6.0 days to the open group which was clinically and statistically significant.

Some literature showed that the average hospital stay for the fast track patients was between 0-7 days with median of 6 days as showed by A Ehrlich and his colleagues<sup>(5)</sup>, in our study mean length of hospital stay was 11.7 in open colectomy while it was 8.10 days in the fast track group. These results support the importance of both laparoscopic surgeries and the fast track protocol in early recovery and decreasing hospital cost by decreasing the average of hospital stay.

On the other side the mean blood loss in our study was 301CC in open colectomy group and 224CC for the fast track group which was statistically significant.

Also adding the laparoscopic approach showed less morbidity and mortality which was reflected on the hospital stay and early recovery. Our study showed that laparoscopic colectomy had less rate of intraoperative structures injury in comparison to open colectomy. This can be due to good exposure of the field, perfect illumination and high magnification power.

The postoperative Chest complications in our study was also less in the fast track group compared to the open group which also can be explained by adding the laparoscopic approach as a part of the fast track protocol in addition to the early mobilization as an important element of the fast track protocol

The Postoperative local complications related to bowel surgery was also less in the fast track group compared to the open colectomy group with minimal post-operative ileus as shown in the results which was reflected on decreasing the average hospital stay in the fast track group compared to the open group.

There was no statistically significant difference in the distribution of some peri-operative complications between Fast track and open groups, as regard DVT, pulmonary embolism, anastomotic breakdown, adhesive intestinal obstruction and local wound recurrence or port site metastasis However wound complications (wound infections, wound dehiscence & incisional hernia) seemingly were more frequent, statistically in cases having open colorectal resections (more traumatized potentially contaminated wounds), these complications may affect the length of stay. Better assessment of these complications can be assessed later in different studies with larger number of patients and more diverse cases.

### Conclusion

Implementation of the laparoscopic approach for coloractal carcinoma as a part of fast track protocol is an effective and

safe way which promote early recovery and decrease hospital stay giving the synergistic advantages of both the fast track protocol and laparoscopic surgery.

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