International Surgery Journal
Bhandari V et al. Int Surg J. 2020 Mar;7(3):861-866
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20200834

Original Research Article

Compare the clinical and postoperative outcomes: laparoscopic versus open surgery

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Received: 26 December 2019
Revised: 11 February 2020
Accepted: 13 February 2020

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ABSTRACT

Background: To assess the several postoperative complications and clinical outcomes, a retrospective comparison between laparoscopic or open surgery was performed.
Methods: We evaluated patients baseline characteristics clinical characteristics, perioperative, intraoperative, inflammatory stress markers and postoperative outcomes between the two groups by univariate analysis.
Results: Total 73 patients' data were included and divided into two groups. 38 patients in first group (laparoscopic surgery) and 35 patients in second group (open surgery). There were no statistically significance differences between gender, age, weight, body mass index and type of surgery of the patients ($p>0.05$). There was no significant difference between groups in history of infliximab, history of steroid usage, history of appendectomy and perianal disease ($p>0.05$). There was no significant difference between groups in total protein, albumin, hemoglobin, skeletal muscle mass and soft lean mass. Operative time, length of incision and blood loss was significantly ($p<0.001$) different in both groups, respectively. Total number of complications was less in the laparoscopic surgery; however, there was no statistically significant difference. Laparoscopic surgery can shorten the hospital stay by around one day. Patients had better postoperative outcomes after laparoscopic surgery than after open surgery. No significant difference was present in edema grades between groups preoperatively. More patients developed slight edema and edema in open surgery than in laparoscopic surgery on postoperative day (POD-3), but not on POD-5.
Conclusions: Laparoscopic surgery has more benefits, safe and high-quality care and better postoperative clinical outcomes for all patients compared to open surgery.

Keywords: Clinical outcomes, Laparoscopic surgery, Open surgery, Postoperative complications

INTRODUCTION

Open surgery is the traditional type of surgery in which an incision is made using a scalpel. While this can be done safely and effectively, the larger incision can cause longer hospital stays, longer recovery, more pain, larger scars, higher risks of complications such as bleeding and infections.[1] Laparoscopic, or endoscopic, surgery is a minimally invasive procedure that uses several small cuts in the skin to access the surgical area. The doctor uses a tiny camera to view the area and small tools to perform the surgery.[1,2] Currently, laparoscopic surgery has been widely applied in patients with Crohn's disease because its safety and feasibility were confirmed, and many studies have exhibited its advantages more than open surgery.[3-5] The laparoscopic approach to conventional surgery is a burgeoning area of surgical practice, with new techniques and procedures introduced on a yearly if not monthly basis. This revolution has been fueled by the belief among surgeons, referring physicians, and the general public that laparoscopic procedures are minimally invasive. Laparoscopic surgery brings many short-term

and long-term benefits over open surgery, such as reducing postoperative complications, promoting postoperative recovery, and reducing hospital stay and lead to a faster recovery, entail less pain compared to traditional open surgery.[6,7] Although there is a large figure of literature concerning the technical success of completing these procedures.[8,9]

The procedure has become the gold standard for many organ systems, with some of the most common being digestive (as for cholecystectomy), and reproductive (particularly gynecological). Significant improvements in surgical training, as well as developments of instruments, imaging, and surgical techniques, have made laparoscopic surgery safe and feasible across different medical fields. However, laparoscopic surgery also has the advantage of less trauma, less pain postoperatively and a reduced hospital stay for patients. Crohn's disease is a chronic inflammatory gastrointestinal disorder, characterized by phases of remission and frequent relapses that often need surgical intervention.[10]

Surgery is often necessary to treat complications such as abscess, fistula, stricture, bleeding, or failed responses to medical therapy.[10,11] In previous years, laparoscopy took longer time than open section surgery but now laparoscopy can be completed in about the same time as open section, mainly due to the accumulation of practical surgical experience using this technique; one additional benefit is the reduced occurrence of complications.[12]

Some data have been published on pain medication requirements and the relative number of days for hospital stay or return to work, little research has been done on quality of life using standardized, validated measures of health status. In this study we compared the clinical outcomes and postoperative complications undergoing the same procedures in laparoscopic surgery versus open surgery.

METHODS

It is an observational retrospective data was collected from department of General Surgery at Sri Aurobindo Medical College and PG Institute, Indore between June 2018 to July 2019.

Total of 73 patient's data were enrolled in this study and divided into two groups as first group (laparoscopic surgery) 38 patients and second group (open surgery) 35 patients.

All data of patient's baseline characteristics, perioperative, inflammatory stress markers and complications outcomes were collected on following selection criteria from prospectively maintained data sheet.Baseline characteristics includes age (year), gender, body mass index (BMI) (kg/m^2), duration of disease (months), history of appendectomy and perianal disease.

Clinical parameter includes total protein (g/l), albumin (g/l), hemoglobin (g/l), skeletal muscle mass(kg) and soft lean mass (kg)

Type of surgery includes colonic resection, small bowel resection and ileocolic resection. Intraoperative outcome include operation duration (min), length of incision (cm) and blood loss (ml)

Surgical indication includes internal fistula/mass, inflammation, hemorrhage and stricture. Postoperative outcome includes dehiscence of incision, infection of incision, abscess/mass, anastomotic leakage, postoperative hospital stays (days) and others

Postoperative recovery includes time to bowel movement (hours), time to flatus (hours) and time to tolerate EN (days)

Edema grades was considered before surgery (pre-operative) and on postoperative day 1 (POD1), postoperative day 3 (POD3), and postoperative day 5 (POD5).

Inclusion criteria

Only those data were included in study who has a complete information as per our selection criteria.

Exclusion criteria

Vaginal fistula, enterocutaneous fistula, abscess, extensive abdominal adhesions, and any diseases that could influence water distribution, such as hypertension, liver dysfunction, renal disease, endocrine disorder, or other systemic diseases data were not included in this study.

Statistical analysis

The collected data were numerically coded and entered in Microsoft Excel 2007 and statistical analysis was done in SPSS version 21.0. Socio-demographic variables data were analyzed using descriptive statistics like frequencies, mean and standard deviation. Chi-square test of association or Fishers exact probability test was used as applicable to assess the association between associated variables. A p value less than 0.05 was considered statistically significant.

RESULTS

A total of 73 patients data included in this observational cohort study. Thirty-five patients in laparoscopic surgery and 38 patients in open surgery. The mean age was 33.21±11.05 in laparoscopic surgery and 34.41±12.25 in open surgery, mean BMI 18.72±2.95 vs 18.59±2.61, respectively. Duration of disease (months) was 36.73±32.56 in laparoscopic surgery and 37.48±30.22 in open surgery. There was no significant difference

between groups in history of infliximab, history of steroid usage, history of appendectomy and perianal disease (Table 1). Preoperative nutritional status nutritional, support, was improved, and no patient had severe hypoalbuminemia or anemia. Total protein, albumin, hemoglobin, skeletal muscle mass and soft lean mass were seen in Table 2.

Table 1: The demographic and baseline characteristics of patients.

Variable	Laparoscopic surgery (n=35) N (%)	Open surgery (n=38) N (%)	P value
Age (in years)	33.21±11.05	34.41±12.25	0.662
≤16	4 (11.5%)	3 (7.9%)	0.608
17–40	23 (65.7%)	24 (63.2%)	0.819
>40	8 (22.8%)	11 (28.9%)	0.553
Sex (male/female)	11/24	13/25	0.847
BMI (kg/m^2)	18.72±2.95	18.59±2.61	0.842
Duration of disease (months)	36.73±32.56	37.48±30.22	0.919
History of infliximab	6 (17.1%)	5 (14.2%)	0.634
History of steroid usage	18 (51.4%)	20 (52.6%)	0.918
History of appendectomy	9 (25.7%)	17 (27.87)	0.089
Perianal disease	8 (22.8%)	11 (28.9%)	0.553

Table 2: Clinical parameter of patients.

Clinical parameter	Laparoscopic surgery (n=35)	Open surgery (n=38)	P value
Total protein (g/l)	63.36±7.70	62.38±7.83	0.591
Albumin (g/l)	37.38±4.03	37.57±4.06	0.841
Hemoglobin (g/l)	114.28±15.94	113.78±17.46	0.899
Skeletal muscle mass (kg)	25.13±5.85	24.12±5.77	0.460
Soft lean mass (kg)	40.87±8.68	40.81±9.37	0.977

Table 3: Comparison of intraoperative data between groups.

Variable	Laparoscopic surgery (n=35) N (%)	Open surgery (n=38) N (%)	P value
Type of surgery			
Colonic resection	4 (11.5%)	8 (21.0%)	0.267
Small bowel resection	9 (25.7%)	10 (26.4%)	0.953
Ileocolic resection	22 (62.8%)	20 (52.6%)	0.377
Hand-assisted anastomosis	10 (28.5%)	-	-
Operation duration (min)	122.54±34.63	87.86±25.32	<0.001
Length of incision (cm)	5.01±1.24	10.31±1.78	<0.001
Blood loss (ml)	55.11±22.34	123.26±53.72	<0.001
Surgical indication			
Internal fistula/mass	9 (25.8%)	10 (26.4%)	0.953
Inflammation	3 (8.5%)	3 (7.8%)	0.916
Hemorrhage	3 (8.5%)	2 (5.3%)	0.576
Stricture	20 (57.2%)	23 (60.5%)	0.769

There was no difference in types of surgery between groups. Operation duration (min) was 122.54±34.63 in laparoscopic surgery and 87.86±25.32 in open surgery. The length of incision of open surgery was much longer than that of laparoscopic surgery 10.31±1.78 vs 5.01±1.24, respectively. Blood loss (ml) was less in laparoscopic surgery as compare to open surgery, there were the significant difference occur. There was no significant difference in surgical indication in both groups (Table 3). A surgery-associated complication included dehiscence of incision, infection of incision, abscess/mass, anastomotic leakage and others complication was show in Table 4. Postoperative hospital stays (days) was 7.62±2.86 in laparoscopic surgery and 8.64±3.52 in open surgery. Laparoscopic surgery can shorten the hospital stay by around one day. Patients had better postoperative outcomes after laparoscopic surgery than after open surgery (Table 4).

Table 4: Comparison of complication and postoperative recovery.

Complications	Laparoscopic surgery (n=35)	Open surgery (n=38)	P value
	N (%)	N (%)	
Dehiscence of incision	1 (2.8)	1 (2.6)	0.952
Infection of incision	3 (8.5)	6 (15.7)	0.348
Abscess/mass	3 (8.5)	3 (7.8)	0.916
Anastomotic leakage	1 (2.8)	2 (5.2)	0.604
Others	2 (5.7)	2 (5.2)	0.932
Postoperative hospital stay (days)	7.62±2.86	8.64±3.52	0.180
Postoperative recovery			
Time to bowel movement (hours)	65.85±19.46	76.15±23.96	0.048
Time to flatus (hours)	41.50±12.98	52.83±15.96	0.001
Time to tolerate EN (days)	4.42±1.27	5.01±1.44	0.068

Table 5: Comparison of evolution of edema grades between groups.

	Laparoscopic surgery (n=35)	Open surgery (n=38)	P value
	N (%)	N (%)	
Pre-operative			
Normal	26 (74.2)	28 (73.6)	0.953
Slight edema	5 (14.2)	8 (21.1)	0.450
Edema	6 (11.4)	2 (5.3)	0.104
POD3			
Normal	15 (42.8)	6 (15.8)	0.010*
Slight edema	7 (20.0)	12 (31.5)	0.260
Edema	13 (37.2)	20 (52.7)	0.184
POD5			
Normal	16 (45.7)	13 (34.2)	0.315
Slight edema	13 (37.1)	12 (31.6)	0.616
Edema	6 (17.2)	13 (34.2)	0.096

Pre-operative slight edema and edema was in laparoscopic surgery 5 (14.2%), 6 (11.4%) and 8 (21.1%), 2 (5.3%) in open surgery. On POD3 slight edema and edema was in laparoscopic surgery 7 (20.0%), 13(37.2%) and in open surgery 12 (31.5%), 20 (52.7%). And on POD5 developed slight edema and developed edema 13 (37.1%), 6 (17.2%) vs 12 (31.6%), 13 (34.2%). No significant difference was present in edema grades between groups preoperatively. More patients developed slight edema and edema in open surgery than in laparoscopic surgery on POD3, but not on POD5 (Table 5).

DISCUSSION

This is study to determine if the laparoscopic approach to these surgical problems leads to better clinical outcomes than open surgery. In present study there was no difference in types of surgery between groups. Operation duration (min) was 122.54±34.63 in laparoscopic surgery and 87.86±25.32 in open surgery. When compared with conventional open surgery, the benefits of laparoscopic surgery have been widely investigated and confirmed in Crohn's disease.[13-18] In this study the length of incision of open surgery was much longer than that of laparoscopic surgery 10.31±1.78 vs 5.01±1.24. blood loss (ml) was less in laparoscopic surgery as compare to open surgery. Laparoscopic surgery can shorten the hospital stay by around one day. Patients had better postoperative outcomes after laparoscopic surgery than after open surgery. Unlike local edema caused by local surgery, such as thyroidectomy or hand surgery, all five segmental edema indexes increased after surgery, indicating that abdominal surgery resulted in generalized edema.[19-21] The generalized edema is associated with a systemic response to surgery.[22-24] Postoperative edema is associated with poor clinical outcomes, such as delayed healing, more complications, slow bowel function recovery, and longer hospital stay.[19,21] Itobi et al reported that postoperative edema could independently predict gastrointestinal recovery, and measurement of edema can be used to identify those patients at risk of poor clinical outcomes.[19] In current study no significant difference was present in edema grades between groups preoperatively. More patients developed slight edema and edema in open surgery than in laparoscopic surgery on POD3, but not on POD5. A smaller number of patients with postoperative edema and lower value and increment of the edema index were found in the laparoscopic surgery group than the

open surgery group. In an animal study, when compared with open surgery, the laparoscopic surgery groups had faster intestinal transit recovery was associated with less edematous changes, and the faster intestinal transit recovery.[25]

In this study on POD5 developed slight edema and developed edema 13 (37.1%), 6 (17.2%) vs 12 (31.6%), 13 (34.2%). Similarly, previous study was reported that about 53% (20/38) of patients develop edema after major abdominal surgery and Vaughan-Shaw et al reported that approximately 35% (19/55) of patients develop edema after emergency abdominal surgery.[19,20] Less surgical trauma and stress of laparoscopic surgery, less postoperative edema indicated. In the perioperative period, the levels of inflammatory and edema index increased and decreased, on POD3, indicating the natural course of stress responses and body recovery after surgery. The benefits of laparoscopic surgery are associated with less postoperative edema, surgical trauma, and stress to surgery consequently.[22-25] The present study suggested that laparoscopic surgery can reduce postoperative edema and response to surgical trauma and stress, as well as speed postoperative recovery compared with open surgery. Reduction of postoperative edema may explain the association of laparoscopic surgery with better clinical outcomes. All patients come by routine enterectomy, and no deaths were observed. All patients were discharged without any complications that required surgical interventions.

CONCLUSION

The laparoscopic surgery and open surgery was compared. Laparoscopic surgery has more benefits due to short hospital stay, less blood loss, reduced operation duration, faster recovery, reduce postoperative edema and speed, reduce surgical indication levels like inflammatory and stress responses to surgery for patients with Crohn's disease. The length of incision of open surgery was much longer than that of laparoscopic surgery. Laparoscopic surgery has more benefits, safe and high-quality care and better postoperative clinical outcomes for all patients compared to open surgery.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Bhandari V, Bhandari M. Compare the clinical and postoperative outcomes: laparoscopic versus open surgery. Int Surg J 2020;7:861-6.