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Comparison of Laproscopic Surgery Versus Traditional Laprotomy for the Treatment of Emergency Patients

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Abstract

Background-To investigate the clinical efficacy of laparoscopic gastrointestinal emergency surgery and postoperative complications. **Methods-**Data for 604 patients undergoing emergency gastrointestinal surgery between between January 2020 and December 2023 were analyzed retrospectively. Treatment efficacy and postoperative complications were compared between 300 patients (control group) undergoing traditional laparotomy and 304 patients (observation group) undergoing laparoscopic surgery. **Results-** The total complication incidence in the observation group was 3.9%, compared with 16% in the control group (16%). No significant differences in direct medical costs were recorded between the observation and control groups. **Conclusions-**For patients undergoing emergency gastrointestinal surgery, laparoscopic surgery resulted in better clinical outcomes than traditional laparotomy without incurring additional costs.

Introduction

Trauma is the fourth leading cause of death in the overall population, while it is the main cause of death during the first half of the human life span.[1] Besides, 9~14.9% of all trauma cases involve the abdomen.[2] Abdominal trauma is one of the preventable causes of death in polytrauma patients[3], and laparotomy has traditionally been considered as the standard treatment.[4] However, since laparotomy is associated with morbidity ranging from 20 to 40%[5,6,7], it may be preferable to avoid unnecessary laparotomies. In haemodynamically stable conditions and conducted by experienced surgeons, laparoscopy is an effective and safe in the management of abdominal trauma patients.[7] Advances of imaging technology and selective non-operative management have led to a decrease in non-therapeutic laparotomy for haemodynamically stable patients. Studies have also shown that since the introduction of the laparoscopy procedure, the rate of non-therapeutic laparotomy has further decreased. Moreover, as a diagnostic or therapeutic tool, laparoscopy involves less pain and results in a shorter hospital stays and faster recovery times than laparotomy.

Acute appendicitis, peptic ulcer perforation, intestinal obstruction, colorectal rupture, and acute gastrointestinal hemorrhage are all commonly treated by emergency gastrointestinal surgery. These illnesses share clinical characteristics including acute onset, severe abdominal pain, and symptoms of diarrhea, nausea, and vomiting.[8] Cases can become life-threatening in the absence of immediate proper treatment, which generally entails traditional laparotomy. However, such treatment is inevitably associated with significant disadvantages including a large wound and prolonged post-operative recovery time. Rapid developments in laparoscopic surgery have recently revealed its potential for improving the efficacy and clinical outcomes of emergency gastrointestinal surgery. These include a smaller wound, shorter recovery time, enhanced safety, and surgical accuracy. With these apparent advantages, laparoscopic surgery could become the method of choice for performing emergency gastrointestinal surgery.

Methodology

In total, the outcomes of 604 patients undergoing emergency gastrointestinal surgery between January 2020 and December 2023 were analyzed retrospectively. All cases in the study period were included. The control group underwent traditional laparotomy, and the observation group received laparoscopic surgery. For all patients, diagnosis was confirmed on the basis of appropriate disease-specific criteria. Patients were all admitted without severe cardiovascular or brain disease.

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Data were compared between the groups to retrospectively evaluate the features of surgery and post-operative outcomes including the duration of surgery, intraoperative blood loss, post-operation pain score, duration of hospital stay, and incidence of complications. Comorbidities were also calculated. All details of ethical approval and human rights of this study were approved by the Meenakshi Medical College, Hospital and Research Institute, Kanchipuram. Our findings revealed the clinically significant advantages of laparoscopic surgery and provide reference values for future research and clinical practice. Patients in the control group underwent traditional laparotomy under general anesthesia for diagnosis and treatment. Those in the observation group underwent laparoscopic surgery under general anesthesia. The surgeons were all senior professors (male; 45–55 years old) in the GI Surgery Department with more than 15 years of experience. Drainage tube placement was based on the individual patient condition. All surgical procedures conformed to clinical guidelines appropriate for specific gastrointestinal disease treatment including selection of the incision site and avoidance of intestinal adhesions. The surgery-associated features analyzed and compared in this study were as follows: duration of surgery, intraoperative blood loss, post-operation pain score, duration of hospital stay, and incidence of complications. The pain score was determined 24 hours after surgery based on a visual analog scale and scored as follows: painless, 0 to 2; mild pain, 3 to 5; moderate pain, 6 to 8; and severe pain, 9 to 10. Complications were recorded during a 3-month postoperative follow-up period. Direct medical costs (admission fees, procedure fees, consumable fees, medication fees, and nursing fees) spanning from the time of patient admission to discharge were tabulated using hospital charge lists. Statistical analysis was performed using SPSS 23. 0 software. Data were presented as the mean ± SD. Student's *t*-test was used for comparison between groups. The χ^2 test was used for enumeration data. $P < 0.05$ was considered significant.

Results

Patient ages ranged from 17 to 79 years (mean, 40.1 ± 10.5 years). The 604 study patients comprised 240, 136, 128, and 100 cases of peptic ulcer perforation, acute appendicitis, colorectal rupture, and intestinal obstruction, respectively. The control group (n = 300; 160 men and 140 women; mean age, 39.2 ± 11.5 years) was treated via traditional laparotomy. The observation group (n = 304; 166 men and 136 women; mean age, 36.1 ± 10.2 years) was treated by laparoscopic surgery.

Table 1.-Patient profiles.

Features	Observation group	Control group	Total
Number	304 (50.3%)	300 (49.7%)	604
Age, years (range)	40.1 ± 10.5 (17–79)		
	36.1 ± 10.2	39.2 ± 11.5	
Gender			
Male	166 (50.9%)	160 (49.1%)	326
Female	136 (49.3%)	140 (50.7%)	276
Diseases			
Peptic ulcer perforation	136 (56.7%)	104 (43.3%)	240
Acute appendicitis	87 (64.0%)	49 (36.0%)	136
Colorectal rupture	65 (50.8%)	63 (49.2%)	128
Oncological reasons	16 (45.7%)	19 (54.3%)	35
Non-oncological	49 (52.7%)	44 (47.3%)	93
Intestinal obstruction	64 (64.0%)	36 (36.0%)	100
Oncological reasons	20 (64.5%)	11 (35.5%)	31
Non-oncological	44, 63.7	25, 36.3	69
Treatment	Laparoscopic surgery	Traditional laparotomy	

Table 2.-Comorbidities.

Comorbidity Classification (n, %)	Observation group	Control group	Total
Total cases	**304 (50.3%)**	**300 (49.7%)**	**604**
Cardiovascular system	91	84	175

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Hypertension	41 (50.0%)	41 (50.0%)	82
Coronary heart disease	26 (53.0%)	23 (47.0%)	49
Arrhythmia	24 (54.5%)	20 (45.5%)	44
Nervous system	44	36	80
Cerebral infarction	31 (53.4%)	27 (46.6%)	58
Epilepsy	13 (59.0%)	9 (41.0%)	22
Endocrine system	82	70	152
Diabetes	46 (51.7%)	43 (48.3%)	89
Hyperthyroidism	20 (50.0%)	20 (50.0%)	40
Hyperuricemia	16 (69.5%)	7 (30.5%)	23
Others	63	64	127
Abnormal liver function	40 (47.6%)	44 (52.4%)	84
Kidney stone	23 (53.5%)	20 (46.5%)	43
Operation history	22	25	47
Gynecological	8 (57.1%)	6 (42.9%)	14

Table 3.-Comparative surgical and postoperative indices.

Group	Case (n)	Operation time (minutes)	Intraoperative blood loss (mL)	Post-operation pain score	Length of hospital stay (days)	Time to free activity (h)
Control	300	70.34 ± 12.83	61.38 ± 9.97	5.13 ± 0.43	7.05 ± 0.13	22 ± 3.02
Observation	304	59.12 ± 10.31	41.21 ± 10.45	1.25 ± 0.25	5.13 ± 0.24	13 ± 2.96
t value		14.9	15.9	20.7	10.2	21.3
P		0.00030	0.00015	0.00002	0.00071	0.00098
		<0.001	<0.001	<0.001	<0.001	<0.001

Table 4.-Comparative postoperative complications during 3 months of follow-up.

Group	Case (n)	Wound infection	Abdominal infection	Septicemia	Vomiting	Nausea	Incidence
Control	300	8	12	4	12	12	48 (16%)
Observation	304	2	0	0	4	6	12 (3.9%)
χ^2							12.26
P value							0.00075
							<0.001

Table 5.-Comparative clinical indices of all subgroups.

	Observation Peptic ulcer perforation	Control Peptic ulcer perforation	Observation Acute appendicitis	Control Acute appendicitis	Observation Colorectal rupture	Control Colorectal rupture	Observation Intestinal obstruction	Control Intestinal obstruction
Case (n)	133	104	87	49	65	63	64	36
Operation time (minutes)	46.57 ± 9.62	66.43 ± 10.75	50.35 ± 11.81	68.44 ± 12.49	57.31 ± 14.16	82.58 ± 18.26	58.04 ± 14.76	79.33 ± 17.56
Intraoperative blood loss (mL)	29.73 ± 5.14	43.27 ± 6.25	37.75 ± 6.84	52.36 ± 8.55	50.21 ± 10.28	72.38 ± 11.14	48.82 ± 10.36	67.26 ± 10.46

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Post-operative pain score	0.76 ± 0.13	3.92 ± 0.55	1.06 ± 0.72	3.80 ± 0.58	1.48 ± 0.36	5.60 ± 0.88	1.34 ± 0.46	5.72 ± 1.24
Length of hospital stay (days)	3.04 ± 0.58	5.22 ± 0.85	4.25 ± 0.79	6.37 ± 0.98	6.04 ± 1.16	9.96 ± 1.84	5.72 ± 0.90	8.92 ± 1.48
Time to free activity (h)	8 ± 1.22	14 ± 2.24	9 ± 1.86	15 ± 3.46	15 ± 3.25	26 ± 5.56	13 ± 3.78	23 ± 4.26
Wound infection (n)	0	2	0	0	1	4	1	2
Abdominal infection (n)	0	3	0	2	0	5	0	2
Septicemia (n)	0	1	0	0	0	2	0	1
Vomiting (n)	1	3	2	4				

Table 6.-Comparison of medical costs (Chinese Yuan, RMB) between the observation and control groups.

Category	Observation group	Control group
Hospitalization	180	169
Laboratory	1495	1531
Radiology	750	762
Nursing	314	332
Medication	6673	7045
Anesthesia	1348	1492
Consumables	7234	6433
Surgery	1909	1747
Covered by NHI	10,015	10,340
Paid by patient	9888	9170
Total	19,903	19,511

Discussion

It is important to quickly and efficiently diagnose and treat cases of acute appendicitis, peptic ulcer perforation, intestinal obstruction, colorectal rupture, and acute gastrointestinal hemorrhage. Such cases can rapidly progress, and patients can experience severe symptoms and signs, including continuous and serious abdominal pain, board-like rigidity, signs of peritoneal irritation, and unstable vital signs. However, traditional laparotomy in the treatment of acute appendicitis and peptic ulcer perforation is usually associated with postoperative complications such as wound infection. The incidence of complications decreases sharply when laparoscopic surgery is employed. The feasibility of replacing laparotomy with laparoscopic surgery can be enhanced through more extensive clinical research and practice, leading to lower rates of misdiagnosis and post-operative complications.[8] Moreover, research has revealed that establishing pneumoperitoneum for intestinal decompression in patients with intestinal obstruction improved treatment efficacy and led to better clinical outcomes including shorter durations of surgery, less intraoperative blood loss, lower postoperative pain scores, and shorter lengths of hospital stay.9

Minimally invasive laparoscopic surgery has been performed for 30 years, and continuous improvements in techniques and equipment have produced a reliable clinical procedure for emergency gastrointestinal surgery.[10] Compared with traditional laparotomy, laparoscopic surgery is more generally accepted, and it is associated with the relative advantages of smaller wounds, reduced pain, shorter operation time, less intraoperative blood loss, shorter length of hospital stay, and fewer complications.[11,12] Additionally, it is possible

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through enlarged,multi-dimension viewing at higher defin-ition and greater illumination to perform laparoscopic surgery without opening the abdominal or exposing organs to the environment. This can lead to a lower incidence and severity of postoperative gastrointestinal irritation and adhesion. However, the technical demands of laparoscopic surgery require the availability of a highly skilled and qualified surgeon for preoperative assessment and emergency treatment.[13] Furthermore, there are several contraindications for laparoscopic surgery including severe cardiopulmonary dysfunction, coagulation disorders, and pregnancy.

The present study confirmed the aforementioned significant advantages of laparoscopic surgery compared with laparotomy for use in emergency gastrointestinal surgery. Laparoscopic surgery yielded significantly better outcomes than laparotomy in terms of the duration of surgery, intraoperative blood loss, postoperative pain score, length of hospital stay, and time to free activity. The same improved outcomes were observed for postoperative complications including wound infection, vomiting, nausea, abdominal infection, and septicemia. These clinical improvements were obtained in the absence of increased medical costs.

Conclusion

In conclusion, based on superior clinical outcomes and similar costs, the present study results demonstrate the clear value of laparoscopic surgery as a general approach for emergency gastrointestinal surgery.

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