

Original Research Article

A prospective observational study on feasibility of laparoscopic perforation repair in patients presenting with intestinal perforation at a tertiary care superspeciality hospital in Chhattisgarh

Deepak Taneja, Akash Gupta*, Sandeep Dave, Siddharth Tamaskar

Department of Minimal Access Surgery, Care Hospital, Raipur, Chhattisgarh, India

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*Correspondence:

Dr. Akash Gupta,

E-mail: akashgupta.gupta261@gmail.com

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ABSTRACT

Background: Bowel perforation is one of the common emergencies faced by the surgeons in the developing world. It carries a high morbidity and mortality rate even today. In the present era, laparoscopy is being used as a better treatment alternative across the world. Various reports in literature are now available regarding the feasibility of laparoscopic repair of bowel perforation. The purpose of this study was to assess the feasibility of laparoscopic primary suture repair as the initial modality in treating a bowel perforation and to analyze the pattern of bowel perforation in relation to age, sex and etiology in Chhattisgarh state.

Methods: This study included the data of relevant patients who got admitted in Ramkrishna Care Hospital Raipur from 1st October 2017 to 31st September 2019 (24 months).

Results: Most commonly affected mean age group in this study was 39±15.82 years with male predominance. Statistically significant findings in favour of laparoscopic repair in our study were early return of bowel activity, less incidence of surgical site infection, early return to work (less hospital stay), less post-operative pain as compared to open surgery (p<0.05).

Conclusions: In this study it was found that laparoscopy in patients with bowel perforation who are hemodynamically stable and present early (<72 hours) to the hospital is feasible and safe and gives many benefits including reduction in perioperative morbidity and mortality.

Keywords: Bowel perforation, Feasibility, Laparoscopic repair

INTRODUCTION

Bowel perforation is one of the common emergencies faced by the surgeons in the developing world. It carries a high morbidity and mortality rate even today. Acute abdomen is responsible for about 40% of all emergency surgical hospital admissions.¹ Risk stratification in cases of perforation peritonitis has been assessed in many studies. Overall mortality that has been reported by various studies and case reports is approximately 10%. The most important therapy for GI perforation is source

control. Traditionally the source control is achieved by surgical means of an "Exploratory laparotomy".¹⁻⁵

Over the years, the conventional treatment of bowel perforation due to various causes has been emergency laparotomy. In the present era, laparoscopy is being used as a better treatment alternative across the world. Various reports in literature are now available regarding the feasibility of laparoscopic repair of bowel perforation.⁴⁻⁹ However, widespread acceptance and application is still not observed.

Hence the present prospective observational study was undertaken to evaluate the feasibility of laparoscopic perforation repair in patients presenting with intestinal perforation.

METHODS

After obtaining the institutional ethics committee approval, present prospective observational study was conducted in the Department of General Surgery at Ramkrishna Care Hospital Raipur located in Chhattisgarh from 1st October 2017 to 31st September 2019 (24 months). During the study period consecutive 41 patients of bowel perforation admitted and treated surgically were included.

Inclusion criteria

Patients of age group 18-65 years who presented to our hospital with signs and symptoms of intestinal perforation, only patients who presented within 72 hours of onset of symptoms were included in study group, patients with trauma were subjected to a CT scan to rule out associated injuries were included.

Exclusion criteria

Hemodynamically unstable patients which require urgent laparotomy, patients having previous history of multiple laparotomies where laparoscopic repair doesn't seem feasible, uncontrolled coagulopathy, pregnant and pediatric patients.

Data was collected in a pre-test proforma which includes the details: age, sex, occupation, subjective complaints (S), objective findings (O), and assessment of clinical condition (A) and plan of management (P).

The analysis of collected data was made with appropriate statistical parameters.

Statistical parameters

Statistics were analyzed with the help of a certified statistician. Continuous data is summarized as Mean±SD (standard deviation) while discrete (categorical) in number and percentage. Quantitative data is analyzed by, mean, SD, T-test. Qualitative data is analyzed by percentage, Chi square test, fisher exact test.

Statistical significance (probability value)

P>0.05 is not significant. P<0.05 is significant. P<0.01 is highly significant.

Sample size calculation by formula

$$N = Z^2 * P * (1-P) / e^2$$

P=proportion of wound infection /complication in laparoscopic repair of bowel perforation=6.67%=0.0667.¹¹ 1.96 =z value for 5% confidence level; e=precision =10%

Cochran formula for descriptive analysis

$$\text{Minimum sample size} = N = \frac{1.96^2 * p * (1-p)}{e^2} = 24$$

RESULTS

During the study period consecutive 41 patients of bowel perforation admitted and treated surgically were included. In the present study mean age of presentation was 39±15.82 years. Male population dominated the study as 80% (n=33) patients included were males and only 20% (n=8) were females (Table 1).

Table 1: Age and sex wise distribution.

Age groups (in years)	No of cases	Sex	No of cases	%
<30	17	Male	33	80
30-50	12	Female	8	20
50-65	12			
Total	41		41	100

Table 2: Etiology wise distribution.

Etiology	No. of patients	Percentage
Peptic ulcer disease	21	51
Infective	5	12
Traumatic	4	10
Drug induced	3	10
Iatrogenic	3	7
Sigmoid diverticulitis	2	5
Sigmoid volvulus	1	3
Idiopathic	1	2

Table 3: Duration since onset (i.e. onset to surgical treatment).

Duration since onset (Hours)	No. of cases	Laparoscopic (%)	Open (%)	P value
Within 24 hours	16	14 (87.5)	2 (12.5)	
24 to 48 hours	8	8 (100)	0	
48 to 72 hours	17	9 (52.95)	8 (47.05)	
Duration since onset (onset to surgical treatment)	Open	Laparoscopy	Total	
Mean±SD (hours)	62.4±20.24	44.13±20.64	46.45±21.41	0.019

Table 4: Distribution according to the site and size of perforation.

Site of perforation	No. of cases	Laparoscopic (%)	Open (%)	Size of perforation	No. of cases	Percentage
Gastric	17	16 (94.11)	1 (5.89)	1 cm	25	61
Duodenal	12	9 (75)	3 (25)	2 cm	14	34
Ileal	6	3 (50)	3 (50)	3 cm	2	5
Sigmoid colon	5	2 (40)	3 (60)			
Jejunal	1	1 (100)	-			

Table 5: Length of adynamic ileus (return of bowel activity).

Length of adynamic ileus (Hours)	Open	Laparoscopy	Total	P value
Mean±SD	64.8±11.59	33.6±12.39	41.81±17.49	<0.0001

Table 6: Intra-abdominal collection development in post-op period.

Intra-abdominal collections in post op period	Open (%)	Laparoscopic (%)	Total (%)	P value
Yes	3 (75)	1 (25)	4 (100)	0.013
No	7 (18.92)	30 (81.08)	37 (100)	
Total	10 (24.39)	31 (75.61)	41 (100)	

Table 7: Distribution according to anastomotic leak.

Anastomotic leak	Open (%)	Laparoscopic (%)	Total (%)	P value
Yes	2 (100)	0 (0)	2 (100)	0.0106
No	8 (20.51)	31 (79.49)	39 (100)	
Total	10 (24.39)	31 (75.61)	41 (100)	

Table 8: Distribution according to surgical site / port site infection.

Surgical site/Port site infections	Open (%)	Laparoscopic (%)	Total (%)	P value
Yes	6 (66.67)	3 (33.33)	9 (100)	0.0008
No	4 (12.5)	28 (87.5)	32 (100)	
Total	10 (24.39)	31 (75.61)	41 (100)	

Table 9: Distribution according to hospital stay.

Hospital stay	Open (%)	Laparoscopic (%)	Total (%)	P value
Mean±SD	14.1±7.95	6.9±2.6	9.19±5.62	0.0008

Table 10: Mortality.

Mortality	Open (%)	Laparoscopic (%)	Total (%)	P value
Yes	2 (100)	0 (0)	2 (100)	0.0106
No	8 (20.51)	31 (79.49)	39 (100)	
Total	10 (24.39)	31 (75.61)	41 (100)	

The most common cause of bowel perforation was peptic ulcer perforation (n=21, 51%) (Table 2). Mean duration of presentation was 46.45±21.41 hours (Table 3). Duration of presentation was one of the major factors which correlated with feasibility of laparoscopic repair of bowel perforation.

The most common site of perforation was gastric (n=17, 42%) and most cases had a small perforation of 1cm size (n=25, 61%) (Table 4). The major factors which decreased the feasibility of laparoscopic repair of bowel perforation were heavy contamination, dense adhesions obscuring the vision and grossly distended bowel loops which limit the operative space with an increased risk of iatrogenic injury. These factors led to conversion of

laparoscopy to open surgery. A diversion colostomy or ileostomy was required in 7 cases (17%) to protect the anastomosis in selected cases and proved to be beneficial. Laparoscopic cases had a mean operative time of 55.94 ± 12.27 minutes whereas converted cases took a mean operative time of 102.5 ± 20.72 minutes.

Mean length of adynamic ileus for laparoscopic cases was 33.6 ± 12.39 hours, whereas the same for converted to laparotomy cases was 64.8 ± 11.59 hours (Table 5). 4 cases developed intra-abdominal collection in post-operative period. 3 (75%) of them belonged to the converted group whereas only 1 (25%) case of laparoscopic group developed this complication. When considering all laparoscopic cases (n=31), development of post-operative abdominal collection was only in 1 (3.22%) of these cases (Table 6).

2 cases developed post-operative anastomotic leak and both belonged to the converted group. None of the laparoscopic cases developed any post-operative leak (Table 7).

Surgical site infection was seen in 9 cases out of 41. Among the laparoscopic group only 2 patients (6.45%) out of 31 developed port site infection, whereas in converted group 6 patients (60%) out of 10 developed surgical site infection (Table 8). Mean hospital stay for laparoscopic cases was (mean \pm SD) 6.9 ± 2.6 days. Mean hospital stay for converted cases was 14.1 ± 7.95 days (Table 9).

Mortality

Overall mortality was in 2 (4.87%) cases out of 41. Both cases belonged to converted group of cases (20% among 10 cases). Both mortalities were attributed to persistent post-operative septic shock ultimately leading to multi organ failure. There was no mortality in laparoscopically managed cases (Table 10).

DISCUSSION

In the present study mean age of presentation was 39 ± 15.82 years. Male population dominated the study as 80% (n=33) patients included were males and only 20% (n=8) were females. The most common cause of bowel perforation was peptic ulcer perforation (n=21, 51%). Mean duration of presentation was 46.45 ± 21.41 hours. Duration of presentation was one of the major factors which correlated with feasibility of laparoscopic repair of bowel perforation.

The most common site of perforation was gastric (n=17, 42%) and most cases had a small perforation of 1cm size (n=25, 61%). The major factors which decreased the feasibility of laparoscopic repair of bowel perforation were heavy contamination, dense adhesions obscuring the vision and grossly distended bowel loops which limit the operative space with an increased risk of iatrogenic

injury. These factors led to conversion of laparoscopy to open surgery. A diversion colostomy or ileostomy was required in 7 cases (17%) to protect the anastomosis in selected cases and proved to be beneficial.

Laparoscopic cases had a mean operative time of 55.94 ± 12.27 minutes whereas converted cases took a mean operative time of 102.5 ± 20.72 minutes. While comparing time taken for laparoscopic cases, this study resulted with mean time of 55.9 minutes which is comparable to Sinha et al (mean duration of 58.5 minutes) but significantly less than Patel J et al (mean duration of 95 minutes).^{4,5}

Mean length of adynamic ileus for laparoscopic cases was 33.6 ± 12.39 hours, whereas the same for converted to laparotomy cases was 64.8 ± 11.59 hours. 4 cases developed intra-abdominal collection in post-operative period. 3 (75%) of them belonged to the converted group whereas only 1 (25%) case of laparoscopic group developed this complication. When considering all laparoscopic cases (n=31), development of post-operative abdominal collection was only in 1 (3.22%) of these cases. Previous study Abdelaziem et al reported this complication in 2 cases (4%) out of 50 patients, which is comparable to this study.¹⁴ A contradictory result in study Sharma et al reported that none of their cases of laparoscopic bowel perforation repair developed intra-abdominal collection.¹⁵ Another study Anbalakan et al reported this complication in 8.1 % patients, but their study had a large no. of cases (n=332).¹⁶

In present study, 2 cases developed post-operative leak and both belonged to the converted group. None of the laparoscopic cases developed any post-operative leak. Previous data series with large no. of cases i.e. Anbalakan et al and Wilhelmsen et al have reported this complication as 2.1% (7 out of 332) and 3.4% (8 out of 238) respectively which is acceptable in such large data series.^{16,17}

In present study, surgical site infection was seen in 9 cases out of 41. Among the laparoscopic group only 2 patients (6.45%) out of 31 developed port site infection, whereas in converted group 6 patients (60%) out of 10 developed surgical site infection. The fact that there is high risk of surgical site infection in open bowel perforation repair is statistically highly significant (p value.0.0008).

Laparoscopic group showed low rate of port site infection which is comparable to previous studies Sinha et al and Patel et al where both have reported a 10% rate of port site infection (these studies had no conversions to laparotomy).^{4,5}

In present study, the mean hospital stay for laparoscopic cases was (mean \pm SD) 6.9 ± 2.6 days. Mean hospital stay for converted cases was 14.1 ± 7.95 days which is

statistically significantly higher than the laparoscopic group (p value.0.0008).

The result of laparoscopic group is comparable to previous studies by Patel et al and Ramchandran et al where mean hospital stay was of 6 days, but is slightly less than the study by Sinha et al where mean hospital stay was 10 days.^{4,5,18}

In this study the overall mortality was in 2 (4.87%) cases out of 41. Both cases belonged to converted group of cases (20% among 10 cases). Both mortalities were attributed to persistent post-operative septic shock ultimately leading to multi organ failure. There was no mortality in laparoscopically managed cases.

CONCLUSION

Laparoscopy in patients with bowel perforation who are hemodynamically stable and present early to the hospital is feasible, safe and gives many benefits including reduction in perioperative morbidity and mortality. Patients who present late (> 72 hours) in their disease decrease the feasibility of laparoscopy and are better candidates for laparotomy. Statistically significant findings in favour of laparoscopic repair in our study were early return of bowel activity, less incidence of surgical site infection, early return to work (less hospital stay), less post-operative pain.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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