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LETTER

Spectrum of small bowel perforation in a tertiary care hospital of south India: Predictors of morbidity and mortality

Phanikumar Nekarakanti · T P Elamurugan · Vikram Kate

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Editor,

Peritonitis due to small bowel perforation is a common surgical emergency in India [1]. In order to define the current spectrum of small bowel perforation and the factors that can predict the outcome, we reviewed our experience in patients with small bowel perforation. All patients admitted with the diagnosis of small bowel perforation with peritonitis in the Department of Surgery, from September 2010 to July 2012, were evaluated. Patients with peptic ulcer perforation, colonic perforation, and anastomotic dehiscence were excluded. Blood culture and Widal test were done. All patients received ceftriaxone, metronidazole, and aminoglycosides preoperatively. The amount of peritoneal fluid, type of contamination, and characteristics of the perforation namely, the size, site, and number were noted. The choice of procedure was decided by the operating team and included simple closure of the perforation, wedge resection and anastomosis, and resection of pathological segment followed by anastomosis or ileostomy. Anastomosis was done in two layers with polygalactin for the full thickness inner layer and silk for the seromuscular outer layer. Histopathological examination of the edge of the perforation or the resected specimen was done. Patients were treated in the intensive care unit until stabilized. The postoperative blood product requirement, total parenteral nutrition (TPN), catecholamine use, need for ventilator support, and complications like wound infection, burst abdomen, postoperative intraabdominal collection, pneumonia, and anastomotic leak were noted. The complications were graded (grade 0–5) as per the classification proposed by Dindo et al. [2]. The grades of complications were rearranged into two groups, i.e. minor (grade 0,1 and 2) and major (grade 3,4 and 5) complications. The outcome was measured as better and worse outcome groups. Better outcome group included patients who got discharged following surgery either after an uneventful recovery or recovery following minor complications. Worse outcome group included patients who either got discharged after recovery following major complications or expired during the course. Risk factors were subjected to univariate analysis by using Fisher's exact test for predicting better or worse outcome. Multivariate logistic regression analysis was used for the comparison of outcome among various risk factors.

Among 105 patients (81 male) (age 39.8±1.4 years, mean±SD), blunt trauma was the commonest cause of perforation in 36 (34.3 %) patients with 47.2 % of the injury secondary to road traffic accidents. Nonspecific perforations with no identifiable pathology were noted in 30 patients (28.6 %). Eight (7.6 %) patients had perforation secondary to radiation enteritis following radiation for carcinoma cervix. Perforation due to mechanical causes like hernia was found in six (5.7 %) patients. Typhoid infection was identified in five (4.8 %) patients by histopathological examination of the diseased bowel. All patients with nontraumatic perforations were seronegative for typhoid by Widal test. Four (3.8 %) patients had perforation due to tuberculosis infection. Septicemia was noted in 16 (15 %) patients, and *Escherichia coli* was the most common organism isolated from blood cultures of these patients. The mean±SD time lag between presentation and surgery was 16.7±3.2 h. The ileum (69.5 %) was the most common site of perforation. Jejunum and ileum were common sites in traumatic and nontraumatic perforations ($p<0.001$), respectively. Resection and ileostomy were the commonest

P. Nekarakanti · T. P. Elamurugan · V. Kate (✉)
Department of Surgery, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry 605 006, India
e-mail: drvikramkate@gmail.com

Table 1 Univariate analysis of various factors predicting outcome in patients with small bowel perforation

Variable	Outcome		*p*-value
	Better *n*=56	Worse *n*=49	
Age >40 years	25	21	0.443
Male	47	34	0.062
Preoperative SBP <90 mmHg	11	16	0.097
Preoperative renal failure	10	20	0.008*
Hemoglobin <10 g/dL	14	16	0.258
Total protein <6 g/dL	36	41	0.021*
Peritoneal fluid >1 L	14	21	0.042*
Feculent contamination	11	16	0.097
Time lag between presentation and surgery >24 h	5	11	0.049*
ASA ≥3	23	29	0.049*
Stoma creation	17	28	0.005*

*indicates significant values

SBP systolic blood pressure, *ASA* American Society of Anesthesiologists

surgical procedure done (38.1 %) followed by simple closure (25.7 %). Stoma was created in 45 (43 %) patients either after resection or directly exteriorizing the perforation by loop ileostomy. All the patients with perforations due to typhoid and post radiotherapy had stoma done. Triple tube decompression was done in a patient with traumatic duodenal injury. Blood product transfusion was required in 56.2 % patients in the postoperative period. Wound infection was seen in 46.7 % patients. Respiratory complications like pneumonia and transient or prolonged respiratory failure requiring ventilator support were noted in 22 (21 %) and 38 (36.2 %) patients, respectively. Three patients had anastomotic leak, one following simple closure, and two following resection and anastomosis. The mean duration of hospital stay was 15.0±1.0 days (range 1–65 days). There was no correlation between duration of hospital stay and etiology (p=0.899). A hospital stay of more than 15 days was noted in patients who developed any one of the complications except ventilator and catecholamine support. Neither the site of perforation nor the etiology correlated with grade of complications. Preoperative renal failure (p=0.008), total protein <6 g/dL (p=0.02), peritoneal fluid >1 L (p=0.02), time lag between presentation and surgery more than 24 h (p=0.04), and American Society of Anesthesiologists grade ≥3 (p=0.04) were associated with worse outcome on univariate analysis (Table 1). On multivariate logistic regression analysis, patients having preoperative renal failure and patients requiring stoma had a worse outcome (Table 2). Fourteen (13.3 %) patients expired but there was no significant difference in deaths among various etiologies (p=0.245).

There appears to be an appreciable increase in trauma as the etiology of small bowel perforation and a steady decline in the incidence of typhoid perforation as

Table 2 Multivariate logistic regression analysis of various factors for predicting outcome in patients with small bowel perforation

Variables	Outcome^				
	Better (Grade 0, 1, 2) (*n*=56)	Worse (Grade 3, 4, 5) (*n*=49)	*p*-value	OR	95 % CI
1. Age >40 years	25 (44.6)	21 (42.9)	0.308	0.59	0.2–1.64
2. Male	47 (83.9)	34 (69.4)	0.354	0.55	0.16–1.94
3. Hypertension	2 (3.6)	2 (4.1)	0.972	0.96	0.08–11.47
4. Diabetes mellitus	0 (0)	1 (2)	1.000	–	–
5. Preoperative renal failure	10 (17.9)	20 (40.8)	0.008*	4.67	1.51–14.45
6. Preoperative SBP <90 mmHg	11 (19.6)	16 (32.7)	0.363	1.73	0.53–5.62
7. Hemoglobin <10 g/dL	14 (25)	16 (32.7)	0.785	0.85	0.27–2.72
8. Total protein <6.0 mg/dL	36 (64.3)	41 (83.7)	0.177	2.19	0.7–6.81
9. Potassium <3.5 mmol/L	4 (7.1)	5 (10.2)	0.983	0.98	0.17–5.57
10. ASA grade 3 or 4	23 (41.1)	29 (59.2)	0.266	1.77	0.65–4.81
11. Duration of surgery >150 min	17 (30.4)	24 (49)	0.873	1.09	0.36–3.31
12. Time lag between presentation and surgery >24 h	5 (8.9)	11 (22.4)	0.167	2.76	0.65–11.61
13. Feculant type peritoneal fluid	11 (19.6)	16 (32.7)	0.954	1.03	0.33–3.2
14. Peritoneal fluid >1 L	14 (25)	21 (42.9)	0.082	2.57	0.89–7.46
15. Stoma creation	17 (30.3)	28 (57.1)	0.007*	5.44	1.59–18.87

*indicates values are significant, ^ values shown are actual numbers (percentages)

OR odds ratio, *CI* confidence interval, *SBP* systolic blood pressure, *ASA* American Society of Anesthesiologists

compared to the earlier reports [3]. The low positivity rates of typhoid obtained in the present study might be attributed to antimicrobial therapy prior to doing Widal test [3]. Use of bone marrow cultures or novel serological tests like typhoid *t* test may have identified undiagnosed typhoid perforations. Management of traumatic bowel perforations has changed in recent days as majority of traumatic perforations were managed with primary simple closure or primary anastomosis after resection as compared to the dictum of stoma a decade ago [4]. Preoperative renal failure, peritoneal contamination, poor nutrition status, and poor physiological reserve were associated with worse outcome.

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