

Role of laparostomy in preventing early morbidity and mortality in advanced peritonitis patients

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Background: Very few studies are available for the indication and the need of laparostomy in cases of faecal, biliary peritonitis and gangrenous bowel. The open abdomen procedure is one of the greatest surgical advances in recent times, avoiding the development of abdominal compartment syndrome. **Methods:** The present study was a prospective study of the patients who underwent laparostomy during 2yrs study period. Patients who met the inclusion criteria were included in the study. The indications, complications and outcomes of the study were noted. **Results:** Majority of the patients are in the age group of 31 to 40yrs. With laparostomy and damage control surgery recovery was seen in 86.6% patients. Post-operative complications were seen in 33.3% of the patients, with electrolyte imbalance, enterocutaneous fistula, anastomotic leak being the most common complications. Deaths were secondary to septicaemia with mortality rate 16.6%. **Conclusion:** Laparostomy or open abdomen is a useful emergency measure in certain conditions where there is a need for re-exploration for abdomen and cannot be closed due to gross edema and contamination. It reduces operative time and also facilitates re-look operations.

Keywords: Laparostomy, Open abdomen, Septicemia, Relook surgery

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Introduction

Laparostomy is the process by which the fascial edges of the peritoneal cavity are left open without closure after laparotomy intentionally and hence often called Open Abdomen in cases such as fecal peritonitis, biliary peritonitis and gangrenous bowel [1]. The abdominal contents are exposed and

Protected with a temporary coverage. The open abdomen (OA) procedure is one of the greatest surgical advances in recent times and may have enormous application in the daily management of critically ill surgical patients. The OA may be a useful option for treating patients with abdominal sepsis. After trauma or severe sepsis, the abdominal cavity needs to be regularly inspected to ensure that there

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Is no further contamination or spreading of the gangrene in cases of doubtful viability of the gut. Peritonitis is defined as inflammation of peritoneum which may be caused by pathogenic or nonpathogenic organisms. Advanced peritonitis is defined as severe contamination of peritoneum with pathogenic microbes secondary to loss of integrity of gastrointestinal tract in conditions like gangrenous intestine, perforation of intestine including appendix [2].

Laparostomy is currently the treatment of choice in abdominal compartment syndrome. Other indications include damage control laparotomy in poly trauma patients, peritonitis with extensive bowel edema, retroperitoneal edema all of which frustrate the attempt to close the abdomen primarily.

It also ensures free drainage of toxic exudates. The added advantages include ready access to direct visualization of abdominal contents and fascial preservation for future definitive closure. However, the morbidity associated with the procedure may be 25% and hence the management of the frankly open abdomen is a challenge.

Common complications include fluid imbalance, bleeding, contamination of the abdominal cavity, fistula formation and inadvertent damage to the bowel. Several techniques of laparostomy have been advocated. The simplest and possibly the most cost effective is to apply a plastic urobag with suturing all around to the fascia or skin [3].

This prevents evisceration and helps isolation from abdominal bandages and allows easy inspection of viscera through it. Not only the urosac bag is easily available, but also it keeps the wound clean and maintains the moisture in the abdomen which prevents the dryness of viscera.

As there is scarcity of literature regarding the role of Open abdomen in Indian subcontinent, we undertook the study to know the role of laparostomy in patients with advanced peritonitis in terms of operative time, complications, role of re-look surgery in reducing post-operative morbidity and mortality.

Material and Methods

Study design: This was a prospective observational study to know the role of Laparostomy in preventing early morbidity and mortality in patients with advanced peritonitis.

Study sample: All patients who presented with acute abdomen with sepsis who needed emergency surgery from July 2017 to July 2019 in the Department of Surgery and meeting the inclusion criteria were included in the study. Institutional ethical committee (IEC) approval and patient consent was taken before beginning the study.

Inclusion criteria

- Patients of 16-65 years of age and both sexes,
- Emergency laparotomy cases which include polytrauma with severe contamination and edematous bowel, mesenteric ischemia with gangrenous intestine, severe sepsis due to neglected bowel perforation
- patients willing to participate in the study.

Exclusion criteria

- Patients of extremes of age (<16 and >65 years)
- Patients unfit for laparostomy due to severe medical illness
- Patients not willing to participate in the study.

Statistical method- Unpaired t test was used for analysis of continuous data. Pearson's χ^2 test was used for analysis of categorical data. Differences were considered statistically significant, if $P < 0.05$. IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA) software program was used for statistical calculations. Analytical data obtained was compared and discussed with the data available in the literature.

Data collection

Pre-operative period: Patients who came with complaints of pain abdomen are evaluated both clinically and radiologically, which includes X ray, Ultrasonography (USG) abdomen and Contrast Enhanced Computed Tomography (CECT) abdomen wherever necessary. Patients were resuscitated and well hydrated before surgery and electrolyte imbalance is corrected and shifted for operation with reservation of adequate blood. Details of the patient who came with complaint of pain abdomen and underwent laparostomy were recorded in a structured proforma which includes relevant information with regard to detailed history, clinical examination and pre-operative, intra operative and post-operative management. Details regarding the diagnosis of the patient and the necessity for laparostomy and outcomes are noted, both immediate post-operatively and on follow-up.

Intra operative phase: The need for laparostomy is determined on table if the findings like general condition of patient, associated morbidity, presence of edematous bowel loops, gangrenous intestine with severe sepsis. Principle of damage control surgery were followed.

Post-operative phase: Regular inspection of abdominal wound, fluid and electrolyte management, airway, breathing, circulation checked regularly, nutrition status of patient is checked and maintained.

Results

This is a prospective study which evaluated the role of open abdomen in patients presenting with conditions like fecal peritonitis, gangrenous bowel, for the cases where relook is needed. As inclusion criteria included severe sepsis with high bowel contamination or neglected perforation peritonitis with shock which needed relaparotomy we were able to find only 18 patients in study period. Out of 18 patients 15 were males and 3 were females. Most of the patients were in the third decade of life with range from 20 to 70 years as shown in Table 1.

Table-1: Age distribution of the patients (n=18)

21-30years	3	(22.2%)
31-40years	5	(27.7%)
41-50years	3	(22.2%)
51-60years	4	(16.6%)
61-70years	3	(16.6%)

Duration of symptoms varied from 1 day to 21 days with mean of 2.5 days as shown in Figure 1. Most of these patients were with medical co-morbidities like Sepsis (17 patient), Diabetes (1 patient), Hypertension, and were treated in intensive care units.

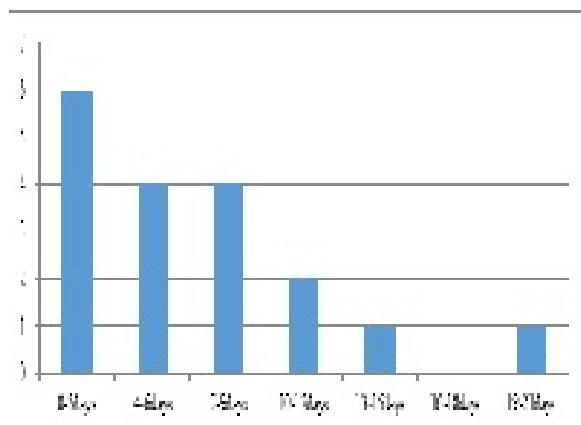


Fig-1: Duration of symptoms (n =18).

Intra operatively findings included gross contamination with bowel edema and bowel perforation (8 patients) and delayed presentation, Massive gangrenous bowel due to mesenteric tears/ischemia (4 patients), Intestinal obstruction due to both dynamic and adynamic causes with gross dilation of bowel which precluded, safe closure of abdomen (4 patients), Enterocutaneous fistula (2 patients). Abdomen was closed temporarily with Urosac bag fixing it to fascial edges of laparotomy incision as shown in Figure 2.



Fig-2: Intra operative image of closing the abdomen with urosac bag.

Hypotension, hypothermia, acidosis and coagulation abnormalities (Lethal triad) were avoided in peri operative period. Post operatively two patients were put on elective mechanical ventilation due to inadequate respiratory effort. Out of 18 cases, 17 cases were taken for relook laparotomy after initial stabilization and closure under general anesthesia after 3-6 days.

Decision to take patient for re look surgery based on patient physiological condition. Approximation of fascial edges was possible in 11cases out of 18 cases and one patient died during immediate post-operative period of 1st surgery.

Post-operative complications were seen in 6 out of 18 patients as shown in Table 2. Most common complication was electrolyte imbalance, which occurred in 5 (27.7%) patients, managed with daily dressings and electrolyte replacement. 2 patients (11.1%) developed anastomotic leak, which was managed conservatively and both patients died. Two patients developed EC fistulas after 7 days of anastomosis of bowel which was closed spontaneously after 3 weeks. One patient died due to septicemia due to pulmonary complications.

Total three patients died postoperatively due to uncontrolled sepsis and anastomotic leak. With laparostomy and damage control technique 15 patients (83.3%) recovered successfully after laparostomy and 3 patients (16.6%) succumbed to perioperative complications.

Table-2: Complications following the surgery (n=6).

Enterocutaneous Fistula	2	11.1%
Anastomotic leak	2	11.1%
Death	2	11.1%

Discussion

Laparostomy is a surgical treatment method in which the peritoneal cavity is opened anteriorly and deliberately left open, hence often called 'open abdomen'. The abdominal contents are exposed and protected with a temporary coverage. The term does not include full-thickness abdominal wall defects resulting from partial excision due to tumor or necrotizing infection, or incisional hernias. Laparostomy is currently used in many severely ill or injured patients to facilitate healing or prevent complications, most notably the development of abdominal compartment syndrome.

It is, however, a morbid procedure with postoperative care that requires good knowledge and skills to prevent even more severe complications. It is also resource intensive, often requiring multiple visits to the operating room and extensive nursing care. With improved understanding of the pathophysiology of common abdominal emergencies, such as abdominal sepsis, severe acute pancreatitis, and major abdominal trauma, as well as their relation to abdominal compartment syndrome, the number of patients with laparostomy can be expected to increase in general and surgical intensive care units. The goal of Laparostomy is the same as in trauma surgery: the initial emergency operation is to be kept as short as possible and focused on limiting the physiological insult [4].

The concept of Laparostomy is based on a sequence of key phase: short initial surgery, ICU for resuscitation, and return to the operating room as soon as normal or near-normal physiology is reached for the definitive operation. In trauma patients, this multistage approach is first of all performed to avoid or correct the lethal triad of hypothermia, acidosis, and coagulopathy, particularly well suited in patients with critical

Hemodynamic conditions, excessive peritonealedema, difficulty to obtain a definitive control of the source of sepsis, incomplete debridement of necrotic tissue, uncertainty about bowel viability, uncontrolled bleeding, and massive abdominal wall loss. The goal of Laparostomy in non-trauma patients is damage control and reduction of mortality.

In the present study, majority of patients were young and in third decade of life and death was mostly secondary to sepsis with mortality rate of 16.6%. this is in contrast to study by Robledo et al [5] on 40 patients with laparostomy, high mortality of 55% was seen in open technique compared to 30% in temporary closure of abdomen. Relative risk and odds ratio were 1.85 and 2.85 respectively. Here the temporary closure of abdomen was done by sandwich technique with non-absorbable mesh sutured to the fascia.

Our study findings are similar to study done by Steinberg et al [1] on 14 patients who underwent open abdomen surgery complication was seen in 2 patients with development of intraabdominal abscess in one patient and another patient died due to septicemia. Mortality rate was 7%. Temporary closure of abdomen was done using Gauze packs.

In another study by Duff et al. [6] described OAM as a last resort treatment of diffuse intra-abdominal sepsis when all other treatment options had failed, and the abdomen could no longer be closed. They observed a mortality rate of 39% and concluded it was a feasible technique. Others supported the concept and OAM gradually became accepted as a technique to achieve adequate drainage of the septic abdominal cavity, thereby decreasing mortality rates from >50% to about 38%.

Laparostomy is currently used in many severely ill or injured patients to facilitate healing or prevent complications, most notably the development of abdominal compartment syndrome. It was, however, a morbid procedure with intense postoperative care that requires good knowledge and skills to prevent even more severe complications. It often requires continuous monitoring in post-operative room and extensive nursing care.

With improved understanding of the pathophysiology of common abdominal emergencies, such as abdominal sepsis, severe acute pancreatitis, and major abdominal trauma, as well as their relation to abdominal compartment

Syndrome, the number of patients with laparostomy can be expected to increase in general and surgical wards.

The current consensus does not support laparostomy and planned relaparotomy as the routine strategy in secondary peritonitis. There are, however, some patient groups where laparostomy is unavoidable or practical. As has been lineated by Moshe Schein, one of the true pioneers in open abdomen, there are abdomens that cannot be closed due to major abdominal wall tissue loss, poor condition of the fascia, or extreme visceral or retroperitoneal swelling, and there are abdomens that should not be closed either to avoid abdominal compartment syndrome or because of a planned reoperation within a day or two.

In a retrospective study involving 523 consecutive patients with secondary peritonitis, Koperna et al [7] evaluated outcomes of 105 patients in whom standard surgical treatment of secondary peritonitis failed and who had to undergo relaparotomy for persisting abdominal sepsis (study group). The lowest mortality rate (9%) was achieved in patients who underwent reoperation within 48h. The results of this study showed that timely relaparotomy should be done early and within 48h.

In a retrospective study by Ordonez et al [8], 112 patients with secondary peritonitis requiring bowel resection who were managed with staged laparotomy were analyzed. The authors concluded that in critically ill patients with severe secondary peritonitis managed with staged laparotomies, deferred primary anastomosis can be performed safely as long as adequate control of the septic foci and restoration of deranged physiology is achieved prior to reconstruction. The open abdomen (OA) procedure is a significant surgical advance, as part of damage control techniques in severe abdominal trauma. Its application can be adapted to the advantage of patients with severe abdominal sepsis, however its precise role in these patients is still not clear.

In severe abdominal sepsis the OA may allow early identification and draining of any residual infection, control any persistent source of infection, and remove more effectively infected or cytokine-loaded peritoneal fluid, preventing abdominal compartment syndrome and deferring definitive intervention and anastomosis until the patient is appropriately resuscitated and hemodynamically stable and thus better able to heal.

However, the OA may require multiple returns to the operating room and may be associated with significant complications, including enteroatmospheric fistulas, loss of abdominal wall domain and large hernias.

Surgeons should be aware of the pathophysiology of severe intra-abdominal sepsis and always keep in mind the option of using open abdomen to be able to use it in the right patient at the right time.

In 2014 the definitive data from the CIAOW study (Complicated intra-abdominal infections worldwide observational study) were published [9]. The study describes the epidemiological, clinical, and treatment profiles of complicated intra-abdominal infections in a worldwide context. The overall mortality rate was 10.5%. Analyzing the subgroups of patients with severe sepsis and septic shock at hospital admission the mortality rate reached 36.5%.

Coccolini et al [10] systematically reviewed all the present literature on the role of open abdomen in non-trauma patient. The World Society of Emergency Surgery (WSES), Abdominal Compartment Society (WSACS) and the Donegal Research Academy united a worldwide group of experts in an international consensus conference to review and thereafter propose the basis for evidence-directed utilization of OA management in non-trauma emergency surgery and critically ill patients.

The review concluded that management Open abdomen is a controversial area and management should be tailored to individual patient needs and available expertise. Every attempt should be made to close the abdomen as early as possible taking all the necessary precautions.

We acknowledge the limitations of present study. Sample size was small, was conducted in single institute, and it was not a blinded study. A Multicenter trial with large number of patients is needed to establish ideal approach in management of these patients.

Conclusion

Laparostomy or open abdomen is a useful emergency measure in certain conditions where there is a need for re-exploration of abdomen and cannot be closed due to gross bowel edema and contamination. It reduces operative time and also facilitates re-look operations but has a high

Morbidity, long hospital stays and mortality. Laparostomy can be done using simple available resources and does not require special equipment and they can be managed in post-operative ward or ICU depending on the patient condition whether to go for laparostomy closure or closure of abdomen with planned relaparotomy in a given situation is a difficult task which requires experience and availability of resources.

What the study adds to the existing knowledge?

The present study is unique in the sense that it addresses the core issue handling and managing patients with peritonitis and septicaemia presenting to Surgery emergency department. Most of the surgeons perform the emergency surgery but owing to poor general condition of patient and inability to close the abdomen put themselves in stressful situation. The present study even though far from perfect guides surgeons how to deal with open abdomen in such difficult situation and provides them an insight to tackle the situation. The study also emphasizes on the importance of Damage control surgery and role of Relook laparotomy which will improve patient's outcome as shown in the present study.

Author's Contribution

Dr. Laxmikanth G.: Study design, data analysis and manuscript preparation.

Dr. P. Inamdar: Study design, data analysis and manuscript editing and proof reading and manuscript submission.

Dr. D. Manogyna: Conceptualization of study, data collection and Manuscript preparation

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