

ORIGINAL RESEARCH

Analysis of Factors Associated with Inability to Perform Delayed Primary Fascial Closure of Open Abdomen in Trauma Patients: An Institutional Based Study

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ABSTRACT

Background: Open abdomen treatment (OAT) involves the deliberate decision not to close the fascia at the end of laparotomy. The present study was conducted to assess the factors which were associated with the inability to perform DPFC in patients with OA.

Materials & Methods: A retrospective analysis of patients with OA undergoing laparotomy for trauma over the last 2 years was done. In the present study, once OA was made, patients were divided into 2 groups: Group A: Patients with OA in whom fascial closure was not possible and had to be managed with STSG/skin only closure and a planned ventral hernia at a later date and Group B: Patients with OA in whom definitive fascial closure was possible during primary admission (delayed primary fascial closure (DPFC)). Clinical and resuscitative parameters were compared in the above 2 groups. Statistical analysis was performed using the latest SPSS software.

Results: In the present study 120 patients with OA were included. After exclusion criteria were applied; only 36 patients were recruited in the study. In 8 patients, abdomen was closed on delayed primary basis, while in 28 patients, STSG/skin only closure was done and was treated as planned ventral hernia. On comparing the clinical profile of the 2 groups showed that acidosis and raised lactate levels also precluded DPFC. Hollow viscus injuries (HVIs) and associated pelvic or abdominal vascular injuries also precluded DPFC ($p < 0.01$), while solid organ injury was not found to be associated. While comparing the infection rates in the 2 groups, we found significantly high blood stream infections (BSIs), ventilator associated pneumonia (VAP), and intra-abdominal sepsis (IAS) in group A patients. There was a significant difference in the initial (ED +intra-operative) blood resuscitation in 2 groups.

Conclusion: The present study concluded that presence of blood stream infections (BSIs), ventilator-associated pneumonia (VAP), and intra-abdominal sepsis (IAS) forbids DPFC.

Keywords: Open Abdomen Treatment, Delayed Primary Fascial Closure, Ventral Hernia.

INTRODUCTION

Open abdomen treatment (OAT) involves the deliberate decision not to close the fascia at the end of laparotomy.^{1,2} This surgical strategy is used in the management of critically ill patients with serious intra-abdominal conditions, e.g. severe secondary peritonitis, abdominal trauma, or abdominal compartment syndrome. Leaving the abdomen open after DCL also helps to fasten the procedure and gives a window for 2nd look surgery.³⁻⁵ OA is also indicated in a few cases of intra-abdominal sepsis (IAS) and as a treatment for abdominal compartment syndrome.^{6,7} There are 3 main indications for open abdomen: anatomical (inability to approximate the edges of the incision, tissue loss or impending risk of ACS), physiological (severe physiologic derangement), and logistical (need for serial surgical interventions while preserving fascia).⁸ OA is also associated with a large number of metabolic and fluid abnormalities and is also a cause for psychological issues, especially in paediatric patients.^{9,10} The planned ventral hernia associated with it usually requires major surgery for closure and hence has a bearing on the psychological well-being of the patient.¹¹ Treatment without fascial closure has severe consequences not only during but also after a hospital stay. Giant planned ventral hernias are an inevitable result and require complex secondary reconstructive procedures, which are also associated with considerable risks.¹²⁻¹⁴ The present study was conducted to assess the factors which were associated with the inability to perform DPFC in patients with OA.

MATERIALS& METHODS

A retrospective analysis of patients with OA undergoing laparotomy for trauma over the last 2 years was done. Those patients who survived till discharge were included in the study, while infants and pregnant females were excluded from the study. Clinical and resuscitative parameters of the patients were studied. Laboratory parameters in the form of complete blood count, coagulation profile, and arterial blood gas analysis were examined. The impact of associated hollow viscus, solid organ, and abdominal vascular injuries on closure were also examined. Associated pelvic injuries which required operative intervention during initial surgery were also analyzed. All patients with OA undergo temporary abdominal closure (TAC) by means of mesh laparostomy. After lavage, the mesh in the midline was closed with sutures which gradually tightened, so as to facilitate DPFC. In the present study, once OA was made, patients were divided into 2 groups: Group A: Patients with OA in whom fascial closure was not possible and had to be managed with STSG/skin only closure and a planned ventral hernia at a later date and Group B: Patients with OA in whom definitive fascial closure was possible during primary admission (delayed primary fascial closure (DPFC)). Clinical and resuscitative parameters were compared in the above 2 groups. Statistical analysis was performed using the latest SPSS software.

RESULTS

In the present study 120 patients with OA were included. After exclusion criteria were applied; only 36 patients were recruited in the study. In 8 patients, abdomen was closed on delayed primary basis, while in 28 patients, STSG/skin only closure was done and was treated as planned ventral hernia. On comparing the clinical profile of the 2 groups showed that acidosis and raised lactate levels also precluded DPFC. Hollow viscus injuries (HVIs)

and associated pelvic or abdominal vascular injuries also precluded DPFC ($p < 0.01$), while solid organ injury was not found to be associated. While comparing the infection rates in the 2 groups, we found significantly high blood stream infections (BSIs), ventilator associated pneumonia (VAP), and intra-abdominal sepsis (IAS) in group A patients. There was a significant difference in the initial (ED +intra-operative) blood resuscitation in 2 groups.

Table 1: Comparison of clinical parameters between 2 groups

Clinical parameters	Group A n=36	Group B n=8
Coagulopathy		
INR	1.36	1.33
aPTT	29.5	30.2
Plt count	198	194
Clinical profile		
Hb	11.42	9.4
Age	25	28
SI	1.1	1.8
Acidosis		
pH	7.26	7.29
Lactate	4.4	5.8
Base deficit	9.2	9
Injury distribution		
Mechanism of injury (blunt: penetrating)	20:16	5:3
ISS>15	21	5
Hollow viscus injuries (no. of patients)	24	5
Solid organ injuries (no. of patients)	9	1
BSI	15	1
VAP	20	1
IAS	15	1

Table 2: Comparison of resuscitative parameters between 2 groups

Resuscitative parameters	Group A n=36	Group B n=8
Resuscitation (ED+IO)		
Fluid	4.3	4
RBC	2	4
FFP	0	4
Plt	0	4
Resuscitation (1ST 48 h)		
Fluid	6.2	6.2
RBC	0	0
FFP	0	0
Plt	0	0
Cryo	0	0
Resuscitation (till 48 h):		
Total fluids	11.4	11.4
Total RBC	4.6	3.2
Total FFP	4.2	2
Total platelets	4.2	2

DISCUSSION

The use of the OA technique has been advocated in many disease processes by acute-care surgeons. Its application allows for serial abdominal examinations and treatments such as ischemic bowel resection, debridement of necrotic/infected material, and hemorrhage control.^{15,16} The use of the OA technique improves mortality rates not only in trauma patients but also in critically ill nontrauma populations with intra-abdominal catastrophes. For example, in the setting of abdominal compartment syndrome (ACS), decompressive laparotomy decreases intra-abdominal pressure, increases abdominal perfusion pressure, and prevents the development of the renal, pulmonary, cardiac, cerebral, and gastrointestinal sequelae associated with this syndrome.¹⁷

In the present study 120 patients with OA were included after exclusion was applied only 36 patients were recruited in the study. In 8 patients, abdomen was closed on delayed primary basis, while in 28 patients, STSG/skin only closure was done and was treated as planned ventral hernia. On comparing the clinical profile of the 2 groups showed that acidosis and raised lactate levels also precluded DPFC. Hollow viscus injuries (HVIs) and associated pelvic or abdominal vascular injuries also precluded DPFC ($p < 0.01$), while solid organ injury was not found to be associated. While comparing the infection rates in the 2 groups, we found significantly high blood stream infections (BSIs), ventilator associated pneumonia (VAP), and intra-abdominal sepsis (IAS) in group A patients. There was a significant difference in the initial (ED +intra-operative) blood resuscitation in 2 groups.

In 2017, Acosta et al. found in a review article including eleven observational studies that high fascial closure rates can be achieved with VAWCM even in elderly non-trauma patients, most of whom presented with peritonitis.¹⁸

A study was conducted by Miller et al. for comparison of patients in patients with OA managed with NPWT who could undergo definitive fascial closure versus patients undergoing temporary abdominal closure followed by planned ventral hernia. Out of 83 patients, they could close the abdomen primarily in 59 patients, while in 24 patients, they treated them as a planned ventral hernia.¹⁹

Goussous N et al concluded that the development of septic complications such as intra-abdominal abscess and enterocutaneous fistulae were associated with inability to primarily close the fascia after DCL. In addition, longer duration of open abdomen management, greater number of serial abdominal explorations, and worse base deficits were negatively associated with primary fascial closure.²⁰

CONCLUSION

The present study concluded that presence of blood stream infections (BSIs), ventilator-associated pneumonia (VAP), and intra-abdominal sepsis (IAS) forbids DPFC.

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