# Improvised Laparostomy Pack to Manage Laparostomy for Injuries due to Improvised Explosive Devices (IEDs)

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## ABSTRACT

Splinters of improvised explosive devices [IEDs] cause multiple intestinal perforations and random pattern visceral injuries causing contamination of peritoneal cavity. This necessitates multiple peritoneal toilets and relook surgeries. Surgical management is to perform laparostomy to avoid life threatening complication, like abdominal compartment syndrome and fulminant sepsis. "Peshawar pack" is a three-layer temporary abdominal dressing pack for managing laparostomy. It is prepared in operation room and applied on patients with ease. Patients with abdominal injuries due to blasts of IEDs, managed with Peshawar pack during June 2014 to June 2016, were studied to determine the effectiveness and practical utility of Peshawar pack. Data was analysed by SPSS version 22. Total numbers, means ±SD and frequencies with percentages were described. In fifty-five patients selected for the study, effective drainage of peritoneal cavity and control of peritoneal sepsis was achieved in all cases. Mobilisation out of bed was possible in 38 cases [70%] within 3-5 days and evisceration during mobilisation occurred in 02 cases [3.6%]. There was no case of iatrogenic gut injury. Complete fascial closure in staged manner was achieved in 53 cases [96%]. Peshawar pack is a simple, practical, and effective method for laparostomy care in abdominal injuries due to blast of IEDs.

**Key Words:** *Improvised explosive devices, Abdominal injuries, Laparostomy, Peshawar pack.*

## INTRODUCTION

Surgical management of abdominal injuries caused by explosions of improvised explosive devices [IEDs] during multiple terrorist attacks has been a unique experience for the surgeons at Combined Military Hospital, Peshawar. Laparostomy is required in a large number of patients for effective peritoneal drainage, prevention of abdominal compartment syndrome [ACS] and re-look surgeries. Managing a laparostomy is a surgical challenge for operating surgeon.[1,2] Various methods of laparostomy management have been described in the literature with merits and limitations.[3,4] The main considerations are: protection of abdominal viscera, prevention of evisceration on straining and mobilisation, relief of abdominal compartmental pressure, appropriate drainage of the intra-abdominal fluid collections, ease of change of dressings and subsequent definitive closure of abdomen. Air evacuation from a field hospital to a tertiary care centre is also a consideration while doing a laparostomy at a field surgical centre. An ideal laparostomy dressing must address these surgical considerations; and in addition should be simple, economical and readily available to the treating surgeon.[4] The authors have devised a simple temporary dressing method for laparostomy; and have named it as 'Peshawar pack'. This study describes the technique, and the clinical value of this method of laparostomy management.

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### Surgical Technique

Composition of Peshawar Pack: Peshawar pack is a homemade laparostomy dressing pack prepared in operation room: The pack consists of three layers. The first layer is an average 10x10 inches "polythene sheet" to cover the gut. It is sieved by making multiple holes in it to ensure free seepage of fluid out from the peritoneal cavity. The second layer consists of a simple abdominal sponge gauze sheet, commonly used in operation theatres during laparotomy for packing and mopping. Sheet is tough and of the size of length and width of laparostomy wound. The third layer of the pack consists of fluffy gauze cover, which acts as an absorbent dressing. A multi-hole drain of 16 French sizes is kept between the second and third layer for intermittent suction. The whole dressing pack is secured with surgical skin tapes.

Application of pack: Step-by-step application of Peshawar pack is shown in Figure 1. After the conclusion of intra-abdominal surgical procedure, the viscera are reduced back into the abdominal cavity, fluid mopped up, and if possible, the omentum spread over the gut. Then the first layer of pack *i.e.* polythene sheet with multiple holes, is placed over the gut and tucked-in, well beyond the edges of laparostomy wound. The second layer of

**First layer:** Sieved/fenestrated polythene sheet to cover the intestines

**Second layer:** Surgical gauze sheet sized to the wound width and sutured to anterior rectus sheath

**Third layer:** Fluffy absorbent gauze with multi hole drain for intermittent suction

**Sealing:** Sealing with adhesive surgical tape – ordinary OR transparent

**Figure 1:** Laparostomy: Steps of application of Peshawar pack.

pack, *i.e.* the tough surgical gauze sheet prepared to the size of laparostomy wound, is then applied over the polythene sheet and placed between the wound edges. It is sutured to the anterior rectus sheath along the full course of laparostomy wound with a running prolene thread. A multi-hole No. 18 drain tube is placed over this sheet for application of intermittent suction. The third layer of fluffy absorbent gauze is applied over the second layer and secured with surgical tapes all around the dressing pack. If a faecal diversion was done, then it would be protected and isolated to avoid contamination of the dressing and the wound.

The essential subsequent care in intensive care unit or ward consists of intermittent application of suction to the drain tube and change of outer most fluffy gauze layer within 24-48 hours or as and when required, *i.e.* when soaked. Saline washing and suction over the second layer can easily be done before application of new dry fluffy gauze layer. Patient would be mobilised as early as possible. First re-look and change of full laparostomy pack is done after 48 hours. Subsequent re-looks and change of laparostomy packs are done in individual case with an interval of 48-72 hours. Re-looks would continue till the peritoneal cavity becomes clean and dry. A complete, tension-free, delayed secondary repair of the facial layer is done when possible. When tension-free closure is not possible then the strategy of staged wound closure is adapted that comprises gradual shortening of width of the second layer to apply tissue traction at wound edges and ensure midline facial closure with subsequent 3-5 changes of laparostomy packs. In case the midline gap between the wound edges is not manageable by this tissue traction method, then a component separation and slide technique is used to ensure a tension-free facial closure.

## METHODOLOGY

Study was carried out at Combined Military Hospital, Peshawar, from June 2014 to Jun 2016. This is a tertiary care hospital and has been engaged in trauma care services, particularly during terrorist attacks in the region. Total fifty-five patients were selected for this study. Patients were received either direct from the blast sites or referred from field hospitals after damage control. The selected patients were cases of "penetrating abdominal injuries caused by splinters of IEDs" requiring open abdomen management, *i.e.* laparostomy. The laparostomy was managed with a "Peshawar pack" prepared in operation theatre. Abdominal injuries due to IEDs blast effects and splinters, where abdomen was closed primarily, managed with other methods of laparostomy. Abdominal injuries due to other causes and abdominal injuries not requiring a laparostomy were excluded from the study. Preoperative clinical state and the details of the body regional injuries were documented. Peroperative findings and details of abdominal organ injuries were noted. Primary surgical procedures carried out were written in detail. Parameters studied to assess the value of "Peshawar pack" were: Availability in emergency and mass casualty situation, ease of application, effectiveness to provide peritoneal drainage and control of sepsis, mobilisation of patient and prevention of evisceration, fascial closure of abdominal wound, cost and complications. Data was analysed by SPSS version 22, and recorded as total numbers, means $\pm$SD for continuous variables and frequencies with percentages for categorical variables.

A total of 55 patients were selected for the study. All had sustained penetrating abdominal injuries due to IED blasts. The age of the patients ranged from 19 to 46 years. Mean age was 29 ±2.1 years. All the patients were males. Thirty-five cases (63.64%) were essentially isolated abdominal injuries with minor soft tissue injuries in other body regions; and in 20 cases (36.3%), there were associated major thoracic, orthopedic and head and neck injuries requiring multidisciplinary specialist care. In 51 (93%) cases, multiple abdominal organs were found injured; and in 4 (7.27%) cases, a single

**Table I:** Clinical gains of "Peshawar pack" (n=55).

| Clinical parameters | No. of cases | Percentage |
|---|---|---|
| Protection of abdominal viscera from injury | 55 | 100% |
| Effective drainage of peritoneal cavity | 55 | 100% |
| Prevention of abdominal compartment effect | 55 | 100% |
| Mobility out of bed within one week | 39 | 71% |
| Prevention of evisceration | 53 | 96% |
| Staged facial closure | 53 | 96% |

**Table II:** Complications of "Peshawar pack" (n=55).

| Complications | No. of cases | Percentage |
|---|---|---|
| Clogging of the middle layer | 17 | 31% |
| Contamination of wound from adjacent stoma for fecal diversion | 11 | 20% |
| Bleeding from the wound edges | 02 | 4% |
| Hospital acquired wound infection in ICU (Pseudomonas and acinetobacter) | 03 | 5% |
| Evisceration due to breaking of middle layer | 02 | 4% |
| Failure to close the facial layer | 02 | 4% |

organ was injured. Small gut was the most commonly injured organ found in approximately 95% of patients (n=52). Clinical gains are recorded in Table I while complications are recorded in Table II.

All underwent a damage control surgery initially and required relook surgery, subsequently. On an average, five relook surgical procedures were performed till the abdominal cavity was finally closed. Pack was easily prepared by the staff in operation room and made available in every case. Junior surgeons could learn its preparation and application with ease. Effective drainage of peritoneal cavity and control of peritoneal sepsis was achieved in all 100% cases evident by clean peritoneal cavity within 3-15 days, average being 8 days. No subphrenic, interloop or pelvic abscess occurred in any case. Mobilisation out of bed was possible in 39 (71%) cases within 3-7 days. No case of iatrogenic gut injury due to laparostomy pack occurred. Complete facial closure was performed in stages manner in 53 cases [96%]. Cost of the pack was about 150 Pakistani rupees. Complications associated with application of Peshawar pack were mostly minor and manageable in ward (Table II). Only two cases [4%] had significant bleeding from wound edges and two cases [4%] developed evisceration due to breaking of suture line along thick middle layer of pack. All these required operative management under general anesthesia. No death is documented in this series of cases.

## DISCUSSION

Open abdomen management, *i.e.* laparostomy, is a life-saving surgical procedure with established value.[1,2] Two broad categories of clinical conditions are considered when laparostomy is indicated, when a tension-free closure of abdominal wound is technically not possible, and when there is a reason for relook surgery. In IED blast injuries of abdomen, either or both of these situations warrant a laparostomy.

Various methods of managing laparostomy by temporary closure technique have been described in literature with merits and limitations.[4] Bogota bag was first described by Oswald Borraez in Bogota, Colombia.[5] It provides a good cover, but it is not strong enough to avoid evisceration when patient is to be mobilised. In a field military scenario, Bogota bag is not practical for air evacuation of casualties. Effective drainage of peritoneal fluid is also not possible with Bogota bag. Peshawar pack is strong enough, and patients can be confidently transferred to other hospitals by road or air routes. Whitman patch is a novel method,[5] but it is not readily available in our set-up. Comparing Peshawar pack with Whitman patch, the strength to contain the viscera, ease of application, change of dressings, and relook are comparable. Peshawar pack is more easily available and more cost-effective than Whitman patch. Negative pressure therapy was applied safely to the pack to keep the abdomen dry.[6] Later, the abdominal wound is closed successfully either by direct closure, skin approximation or component separation, whatever seems feasible on case-to-case basis.[5]

## CONCLUSION

"Peshawar pack" is an improvised, cost-effective, readily available, easily applicable, and in our set-up a very practical method for the management of laparostomy. It ensures protection of abdominal viscera and good drainage of fluid collection, and allows early mobilisation of the patients with minimal risk of evisceration. Definitive staged fascial closure of abdomen is possible in 96% cases.

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