

Temporary abdominal closure using transfer bag in the management of patients with open abdomen

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Received 25 February 2016

Accepted 1 March 2016

The Egyptian Journal of Surgery
2016, 35:321–326

Context

Open abdomen is associated with significant morbidity and mortality. Leaving the abdomen open may be necessary in case of severe peritonitis and associated wound dehiscence. Many techniques are available for temporary abdominal closure (TAC), but none has been proven to be superior.

Aim

In our work, we propose early TAC using a transfer bag that can prevent the evisceration of the abdominal contents. Moreover, it will allow continuous drainage of the patient's septic wound with continuous serial assessment.

Setting and design

It was a prospective case series study.

Patients and methods

The study included 25 patients with difficult abdominal closure in whom a double-layered large transfer bag was used for TAC.

Statistical analysis

Continuous variables were expressed as mean±SD. Categorical variables were expressed as frequencies and percentage.

Results

The average timing of the application of TAC ranged from first to fourth operation, with a mean±SD of 2±1.38. Early mortality occurred in six patients, whereas delayed mortality occurred in two patients. The net survivors included 17 (68%) patients. Of them, two patients were subjected to simple skin closure, six were subjected to split thickness skin graft, and nine were subjected to early fascial closure with lateral release and mesh application. Average timing for closure or coverage was 10–45 days, with a mean±SD of 25.8±11.8 days. An intestinal fistula was seen in three (12%) patients. The average length of hospital stay was 38.84±11.75 days.

Conclusion

The use of transfer bag TAC for open abdomen is a safe, cheap, available, simple, and effective procedure that can provide an easy access to the abdomen when needed.

Keywords:

open abdomen, temporary abdominal closure, transfer bag

Egyptian J Surgery 35:321–326
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1110-1121

Introduction

Management of open abdomen has varied considerably during the last decade. Its indication has changed from a last option in abdominal catastrophes to a preferred initial treatment strategy for both traumatic and nontraumatic patients [1]. Open abdomen is associated with significant morbidity and mortality but with better insights into increased intra-abdominal pressure, abdominal compartment syndrome (ACS), and complications such as enteroatmospheric fistulas, increasing experience, and improvements in temporary abdominal closure (TAC) techniques. The outcomes of patients who require open abdomen management have improved, despite an often increased severity of illness and more underlying abdominal conditions [2].

Leaving the abdomen open may be necessary in case of severe peritonitis or associated wound dehiscence, as

the presence of edema and bowel distension may prevent tension-free closure [3]. Under tension closure, the abdominal fascia carries a high risk for mortality, as it is associated with fascial necrosis and ACS, which may also occur in cases of repeated opening and closure, leading to subsequent wound dehiscence and retraction [4].

There are many techniques available for TAC, but none has been proven to be superior [1]. In our work, we propose early TAC with a transfer bag (TAC). Although this method's safety and efficacy are still of great debate, we believe that it can prevent the

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evisceration of the abdominal contents. Moreover, it will allow continuous drainage of the patient's septic wound with continuous serial assessment. Finally, definitive repair can be carried out with either a delayed primary closure or a planned incisional hernial repair using any of the reconstructive techniques [4].

Patients and methods

This prospective case series study was carried out over a period of 3 years from April 2012 to February 2015. It included 25 patients in whom a double-layered large transfer bag was used for TAC. Informed consent was obtained from the patients for the participation in the study according to the Ethical Committee of the Faculty of Medicine, Ain Shams University.

The surgical condition that required open abdomen using transfer bag (Fig. 1) TAC was either post-traumatic ACS or difficult fascial closure due to severe necrosis of abdominal wall and presence of a large defect and recurrent acute wound dehiscence (abdominal burst) because of peritonitis or necrosis of fascial edges. Patients with abdominal burst who were managed with successful fascial closure were excluded from the study as we did not try TAC for them.

An empty sterile double-layered polyvinyl transfer bag is used for coverage. After delabeling, the transfer bag is then cut, trimmed, and fashioned to fill the abdominal defect. It is stitched to fascial edges using interrupted Prolene 0 stitches (Ethicon, Somerville, USA) with rounded-end needles at an interval of 1–2 cm. This avoids the harmful devascularizing effect of the continuous sutures. Sometimes, a pedicled omental flap is placed between the abdominal contents and the bag. The overlying skin

can be approximated or not, based on the situation. The transfer bag is then left in place for 14–21 days (unless changed); this is when the healthy granulation tissue is expected to creep and cover the defect. This healthy granulation tissue will act as a nonhostile bed for later closure or reconstruction.

In some cases, the bag was changed due to accumulation of purulent material beneath the bag, and hence needed drainage and lavage. In others, the bag was disrupted from one side or changed due to relaparotomy (e.g. intestinal fistula).

Closure of abdominal wound after TAC was performed as soon as possible with simple skin closure, split thickness skin graft (STSG) (Fig. 2), or early fascial closure according to the patient's situation; definitive fascial closure using any of the reconstructive techniques was performed for cases that developed incisional hernia.

All cases were followed up 6 months after their wounds had been covered or closed with early fascial closure or skin closure.

Results

The study included 25 patients. Their ages ranged from 26 to 72 years, with a mean±SD of 48.8±15.98 years. Seventeen (68%) patients were male and eight (32%) were female. They were suffering from different surgical conditions that required TAC (Table 1).

Of these 25 patients, TAC was performed for three (12%) patients who suffered from massive abdominal traumas. One of them developed ACS, and hence TAC was performed at the primary exploration; the other two patients developed ACS shortly in the

Figure 1



Sterile transfer bag.

Figure 2



Split thickness skin graft.

Table 1

Surgical diagnosis	No	condition that needed TAC
Massive trauma	3	ACS
Colonoscopic perforation of splenic flexure	1	
Adhesive intestinal obstruction	2	
Perforated appendix	2	
Perforated duodenal ulcer	3	
Strangulated ventral hernia with nectrotizing fasciitis of anterior abdominal wall	2	
Anterior resection for rectal cancer	2	Difficult fascial closure
Iatrogenic small bowel injury after cesarean section	2	
Perforated toxic megacolon in ulcerative colitis	1	
Traumatic duodenal perforation	1	
Left hemicolectomy in cancer colon (leak)	2	
Post appendectomy fistula	2	
Necrotizing pancreatitis	2	
Total	25	

Figure 3

Patient with incarcerated incisional hernia.

postoperative period, and hence TAC was performed in a latter operation.

The other 22 (88%) patients suffered from diffuse septic peritonitis or necrotizing fasciitis of abdominal wall. One of them developed severe fascial necrosis with large defect, and hence TAC was performed at the same setting and was closed in another setting with simple skin closure (Figs 3–6).

In the other 21 patients, exploration was complicated by acute abdominal dehiscence (abdominal burst), and hence they were subjected to a reoperation for either debridement of the abdominal muscles or TAC. In 18 of them, an attempt for fascial closure was made again but they all developed further fascial dehiscence, and hence they were subjected to TAC, whereas it was

Figure 4

Patient after excision of the sac and colonic resection.

Figure 5

Application of the sterile transfer bag to cover the defect.

performed at the second operation without an attempt of reclosure in the other three patients.

Figure 6



Patient after skin closure in a later operation.

The average timing of the application of TAC ranged from the primary surgery to the fourth one, with a mean \pm SD of 2 ± 1.38 , as it was performed at the first operation for two (8%) patients and for three (12%) patients at the second operation. Eighteen (72%) patients were subjected to TAC at the third operation and three (12%) patients at the fourth operation. The mean number of laparotomies needed for the patients was 4.4 ± 0.96 (range: 2–6).

Early mortality occurred in six (24%) patients after the application of TAC but were not related to it, and the causes of death were as follows:

- (1) One (4%) patient died within 48 h due to a severe head trauma.
- (2) Two (8%) patients died on days 4 and 5 from multiorgan dysfunction.
- (3) One (4%) patient died within the first 24 h from a massive myocardial infarction.
- (4) One (4%) patient died on the third day from an end-stage shock.
- (5) One (4%) patient died on the fifth day from acute respiratory distress syndrome.

Of the 19 patients who survived the early postoperative period, two (8%) of them died on days 82 and 100 from liver dysfunction and

disseminated malignancy, respectively. They both died after simple skin closure.

The net survivors comprised 17 (68%) patients. Of them, two patients were subjected to simple skin closure, STSG was applied to six patients, and early fascial closure with lateral release and mesh application was performed for nine patients. Average timing for closure or coverage was 10–45 days, with a mean \pm SD of 25.8 ± 11.8 days and the average number of times the transfer bag was changed was one to four times, with a mean \pm SD of 2 ± 1.38 times.

An intestinal fistula was seen as a complication after performing TAC in three (12%) patients. One of them was managed conservatively, whereas two of them needed a further laparotomy for fistula repair.

Of the nine patients who were subjected to early fascial repair after TAC, three of them developed an incisional hernia that required later repair. Among the other patients who were subjected to either skin closure or STSG, all developed an incisional hernia that needed repair later on.

The average length of hospital stay for those who were subjected to TAC was 19–60 days (mean \pm SD: 38.84 ± 11.75 days).

Discussion

There are many circumstances in which apposition of the fascial edges of the abdominal incision is either not feasible or is potentially lethal. With tissue loss following injury or debridement, or with scarring of the abdominal wall and retraction from previous abdominal operations, reapproximation of the fascial edges may be impossible. Similarly, an increase in the volume of intra-abdominal contents (ACS) may prevent fascial closure [5].

Ogilvie [6] first suggested the use of a prosthetic material for TAC when fascial closure could produce excessive tension, and hence a variety of techniques for TAC were developed later on. The ideal substance for temporary abdominal wall substitution should be resilient enough to maintain its integrity, strong but pliable to prevent erosion into underlying structures, noncarcinogenic, and biologically inert to avoid the inflammatory response [7]. It should be inexpensive, provide secure protection of the viscera, should not adhere to or damage the underlying visceral tissues, and be conducted rapidly and readily [8].

Many authors have used a variety of prosthetic materials for TAC, such as reinforced silicone rubber (silastic), polyester fiber mesh, stainless steel mesh [9], latex rubber, nylon, and nylon reinforced silicone elastomer sheet [10].

Other authors prefer using polyglycolic acid mesh (Dexon) [11] or absorbable woven polyglactin mesh (Vicryl) [8]. In recent times, the most popular materials are sterilized, opened 3 l irrigation genitourinary bag (Bogota bag) or 3 l viaflex intravenous bag [12]. However, no ideal prosthesis could be found, and hence many surgeons are always trying to find some simple solutions to this challenging problem.

In our study, we used the transfer bag utilized for blood and its substitutions as an abdominal wall substitution for TAC. It is made of plasticized polyvinyl chloride that is thought to be inert, malleable, and resistant to heat and cold, thus working as a potential insulator for the abdominal viscera [13]. Its placement takes a few minutes, and, during abdominal re-entry, the bag could be simply removed and can be trimmed to the appropriate size and then applied to the patient's fascia.

ACS was an indication for TAC using the transfer bag in 12% of patients in our study. This finding is nearly similar to those of Tremblay *et al.* [5] and Mayberry *et al.* [14], who found that ACS was the indication in 10 and 13% of patients, respectively, suggesting that TAC for open abdomen was the choice in the majority of these cases.

Among the trauma patients in this study, one of three patients underwent TAC from the start, whereas the other two patients underwent TAC after developing ACS. One of them died later on, suggesting that fascial closure in such type of trauma patients increases the incidence of ACS when compared with TAC.

As regards the fascial closure, we found in our study that the mean \pm SD time for early fascial closure, simple skin closure, or coverage with STSG was 25.8 \pm 11.8 days, whereas Tremblay *et al.* [5] stated that it was within 15 days from the last procedure in 59% of patients.

Enteroatmospheric fistula is one of the potential complications seen when managing an open abdomen. Maddah *et al.* [15] in their study reported that three patients developed intestinal fistulae due to missed iatrogenic injury of the bowel and needed

relaparotomy and closure with serosal patch. In our series also there were three (12%) patients who developed intestinal fistula after insertion of the transfer bag; one of them was treated conservatively and the other two patients needed closure with serosal patch.

Mortality associated with the multiple techniques of TAC remains unclear. In our study, early mortality occurred in six (24%) patients after the application of TAC but was not related to it. The most common cause was multiorgan dysfunction. This is in accordance with the findings of Maddah *et al.* [15] and Schein *et al.* [16], who documented 21% early mortality rate in their studies.

Conclusion

The use of transfer bag TAC for open abdomen is a safe, cheap, available, simple, and effective procedure that can provide an easy access to the abdomen when needed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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