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## Bogota Bag Use in Planned Re-Laparotomies

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**Background:** Planned re-laparotomies are a series of surgical interventions that are rarely used and have a high mortality rate. The aim of this study was to investigate the factors affecting mortality and the effectiveness of the use of the Bogota bag for temporary closure of the abdomen in patients for whom re-laparotomy was planned.





**Material/Methods:** A retrospective examination was made of data of patients in whom a Bogota bag was used in planned re-laparotomies for various reasons in the General Surgery Department of Suleyman Demirel University Medical Faculty between June 2008 and April 2014.

**Results:** Bogota bags were used in a total of 38 patients, comprising 23 (60.5%) males and 15 (39.5%) females, with a mean age of  $58.94 \pm 17.89$  years. The mean period of hospitalization was 14.5 days (range, 1–143 days) and the mean number of operations during that time was 3 (range, 1–11). The mean duration of intensive care unit stay was 6 days (range, 1–143 days). Malignancy was determined in 8 patients (21.1%). Indications were intra-abdominal sepsis in 23 patients (60.5%), mesenteric vascular disease in 10 patients (26.3%), and packing was required in 5 patients (13.2%). Mortality developed in 25 patients (65.8%). A significant relationship was determined between mortality and a diagnosis of mesenteric artery ischemia ( $p: 0.035$ ). The mortality rate was 56% ( $n: 13$ ) in patients diagnosed with intra-abdominal sepsis. A relationship was determined between mortality and age ( $p: 0.015$ ), duration of hospital stay ( $p: 0.007$ ), need for cardiac inotrope ( $p: 0.01$ ), and need for mechanical ventilation ( $p: 0.01$ ). The mean Apache II score was  $26.4 \pm 5$  for patients who died and  $15.8 \pm 5.2$  for surviving patients ( $p < 0.001$ ). In 5 (38.4%) of the 13 surviving patients, primary repair was applied to the abdomen, and in the remaining 8 patients abdominal wall repair was performed using dual mesh.

**Conclusions:** In patients in whom a Bogota bag was used, which is a cheap and easy method for temporary closure of the abdomen, the high mortality rates seen are related to diagnosis, Apache II score, age, and organ failure.

**MeSH Keywords:** **Abdominal Abscess • Abdominal Fat • Animal Experimentation**

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## Background

Temporary closure of the abdomen may be required when a repeated surgical intervention is planned in cases such as intra-abdominal sepsis, when a second look is required, when the operation has to be urgently terminated or abdominal lavage is required, or following damage control surgery, which is currently widely used, or in cases where compartment syndrome has developed or is likely to develop [1]. Temporary abdomen closure has advantages, such as direct visualization of the inside of the abdomen, providing sufficient drainage, and decompression and reducing internal abdominal pressure, in addition to preserving the fascial borders for subsequent abdominal closure. However, this method is related to an increased number of operations and the morbidity associated with extended hospital stays [2]. Various techniques and devices have been described for temporary closure of the abdomen, including skin closure with different types of sutures, the use of a Bogota bag (BB), vacuum-assisted closure, abdominal re-approximation anchor system (ABRA), mesh closure, and compress closure. Of these, the Bogota bag is still one of the most widely used methods due to low cost and ease of application [3].

In this study, a retrospective evaluation was made of patients for whom re-laparotomy was planned and for whom a BB was used for temporary abdominal closure. By examining the factors affecting mortality in this patient group, the efficacy of BB use was evaluated.

## Material and Methods

A retrospective examination was made of data of 38 patients to whom a Bogota bag was applied in planned re-laparotomies for various reasons in the General Surgery Department of Suleyman Demirel University Medical Faculty between June 2008 and April 2014. A record was made of patient age, sex, duration of hospital stay, number of laparotomies, etiology of the disease, presence of malignancy, presence of intra-abdominal sepsis, organ failure on admittance or which developed during hospitalization, method of abdominal closure, Apache II scores, and mortality.

Plastic serum bags were used for the application of BB. Before the application, if abdominal lavage was done, drains put into the rectovesical pouches. These were prepared to the correct dimensions and fixed to the skin with continuous sutures (Figure 1). Until the abdomen was completely clean, the patients were operated on again (STAR procedure) 24–48 h later. When there was no longer any need to monitor the patient with an open abdomen, primary closure of the abdomen was performed. In patients for whom primary closure was not appropriate, herniorrhaphy with dual mesh (polyester with



**Figure 1.** Bogota bag application.

absorbable collagen film) was performed in the final operation when it was decided that the abdomen was clean (Figures 2, 3). All the patients were followed up in the intensive care unit in the postoperative period.

Values of serum bilirubin  $>1.8$  mg/dl were accepted as indicators of liver failure, creatinine  $>2$  mg/dl as kidney failure, thrombocyte  $<150\,000$  as hematological insufficiency, the need for cardiac inotropes as cardiac failure, and the need for mechanical ventilation as respiratory failure.

All statistical analyses were made using SPSS v.16 software. The examined variables were evaluated with the Kolmogorov-Smirnov test and for those with normal distribution we used the Student's t-test and for those non-normal distribution, the Mann-Whitney U test was used. In the evaluation of categorical data, the chi-square and Fisher's exact test were used. Results were evaluated in a 95% confidence interval. A value of  $p<0.05$  was accepted as statistically significant.

## Results

A Bogota bag was used in a total of 38 patients. The patients comprised 23 (60.5%) males and 15 (39.5%) females with a mean age of  $58.94\pm 17.89$  years. The median period of hospitalization was 14.5 days (range, 1–143 days) and the median number of operations during hospitalization was 3 (range, 1–11). The median duration of intensive care unit stay was 6 days (range, 1–143 days). Malignancy was determined in 8 patients (21.1%).



Figure 2. Dual mesh application.



Figure 3. Incision after dual mesh application on postoperative 15<sup>th</sup> day.

The indications for BB application are shown in Table 1. The most common indication was intra-abdominal sepsis in 23 patients (60.5%), mesenteric vascular disease in 10 (26.3%), and a need for packing in 5 (13.2%). Of the 10 patients with mesenteric vascular disease, arterial ischaemia developed in 10 and venous ischemia in the other 3 patients.

Table 1. Indications for Bogota bag application.

Diagnosis	No of patients
<b>Intra-abdominal sepsis*</b>	<b>23</b>
• Perforation due to malignant colorectal disease	2
• Perforation due to gynaecological malignancy	1
• Necrosis in the small intestine	2
• Peritonitis associated with diverticular perforation	1
• Duodenal or gastric ulcer perforation	4
• Diffuse peritonitis associated with appendix perforation	5
• Anastomosis leakage from urological ileal conduit	2
• Anastomosis leakage following bile duct surgery	2
• Intestinal anastomosis leakage	4
<b>Requirement for packing</b>	<b>5</b>
• Abdominal trauma	3
• Postoperative abdominal haemorrhage	2
<b>Mesenteric vascular disease</b>	<b>10</b>
• Mesenteric artery ischaemia	7
• Mesenteric vein ischaemia	3

\* Sepsis developed as a result of intra-abdominal collection.

Twenty-five (65.8%) patients died. While a significant relationship was found between mesenteric artery ischaemia and mortality ( $p=0.035$ ), no statistically significant relationship was determined between other diagnoses and mortality. In patients with intra-abdominal sepsis, the mortality rate was 56% ( $n=13$ ). No statistically significant correlation was determined between mortality and sex, malignancy, or number of laparotomies. In contrast, a significant relationship was found between mortality and age ( $p: 0.015$ ) and duration of hospitalization ( $p=0.007$ ). The mean age of those who died was  $63.9 \pm 16.6$  years and the mean age of survivors was  $49.3 \pm 16.8$  years. The mean duration of hospitalization was 12 days (range, 1–143 days) for those who died and 18 days (range, 13–109 days) for those who survived (Table 2).

When the organ failure criteria were examined, the need for cardiac inotrope ( $p=0.01$ ) and the need for mechanical ventilation ( $p=0.01$ ) were found to be related to mortality. The causes of mortality were intra-abdominal hemorrhage in 2 patients (8%) and multiple organ failure in the other 23 (92%). The mean Apache II score was  $26.4 \pm 5$  for those who died and  $15.8 \pm 5.2$  for those who survived. The mean duration of intensive care unit stay was 10 days (range, 1–143 days) for those who died and 5 days (range, 2–24 days) for those who survived ( $p=0.234$ ).

Of the 13 surviving patients, primary closure of the abdomen was performed in 5 (38.4%) and dual mesh was used for abdominal wall repair in 8 patients.

**Table 2.** Statistical evaluation between the surviving and non-surviving patients.

	Patients developing mortality	Survivors	p value
Gender (male/female)	15/10	8/5	0.927
Age	63.92±16.62	49.38±16.84	<b>0.015</b>
Hospitalisation (days)	12 (1–143)	18 (13–109)	<b>0.007</b>
No of laparotomies	3 (1–11)	3 (2–11)	0.159
Duration of stay in intensive care unit (days)	10 (1–143)	5 (2–24)	0.234
Apache II score	26.48±5.01	15.84±5.27	<b>p&lt;0.001</b>
Malignancy	6	2	0.537
Intra-abdominal sepsis	13	10	0.136
Mesenteric vascular disease	8	2	0.474
Mesenteric artery ischaemia	7	0	<b>0.035</b>
Mesenteric vein ischaemia	1	2	0.548
Requirement for Packing	4	1	0.831

## Discussion

Severe abdominal infections causing distant organ complications are related to a still unacceptably high rate of mortality. The basis of treatment is the successful eradication of the source of infection [4]. In 20–40% of patients with severe infection, re-exploration is required. Re-exploration performed when there are signs of persistent infection or when findings of organ failure emerge generally causes a delay in the diagnosis and treatment of intra-abdominal complications or collections [5]. However, with appropriate patient monitoring (e.g., sufficient monitorization, use of abdominal CT), the damage from potential delays can be prevented [6].

In a meta-analysis comparing traditional surgical treatment with planned re-laparotomy, no conclusion could be reached because studies were non-randomized, patient numbers were limited, and there was no homogeneity between groups [7]. In a study by Rakic et al. [8], the mortality rate was found to be higher (59%) in patients in whom traditional surgical treatment had been used for intra-abdominal sepsis compared to those who underwent planned re-laparotomy. However, it was concluded that rather than the surgical treatment used, the severity of the disease played a more significant role in survival. In our clinic, planned re-laparotomy was preferred for patients in this situation. Until all the cavities of the peritoneal cavity were examined and confirmed as clean, laparotomy was performed every 24–48 hours (STAR procedure) in all patients of the current study. Vacuum-assisted closure, ABRA, and mesh closure can also be used.

Various studies have supported the use of BB for temporary abdominal closure in planned re-laparotomies [1,9,10]. In studies by Offner et al. [11] comparing the application of BB with fascial closure and skin closure in patients undergoing emergency surgery for abdominal trauma, it was found that the patients in the group in which fascial closure was applied developed abdominal compartment syndrome, respiratory distress syndrome, and multiple organ failure at higher rates than in the other 2 groups.

In our clinic, BB was applied for temporary abdominal closure to patients for whom re-laparotomy was planned. BB has the advantages of ease of application, low cost, it does not damage underlying tissue, it provides visualization, and there is no size problem. It can be easily renewed in patients requiring multiple operations. Disadvantages of this application have been reported as evisceration, which may occur from tearing associated with increased abdominal internal pressure, an intestinal fistula may develop, and there is a low rate of primary closure in patients [12].

In the current study, while the general mortality rate was 65.8%, the mortality rate of patients with intra-abdominal sepsis was 56%. The high mortality rate of patients was associated with 94.7% of the patients having at least 1 organ failure, 64% having failure of 2 or more organs, high Apache II score, and the application of this approach for diseases with high mortality rates, such as mesenteric vascular disease, intra-abdominal hemorrhage, and intra-abdominal sepsis.

A statistically significant difference was determined in the Apache II scores of the 2 groups, with survivors as  $15.84 \pm 5.2$  and those who developed mortality as  $26.48 \pm 5$ . The duration of hospitalization was similarly statistically significant with a shorter hospitalization period for those who died. No statistically significant difference was determined in respect to length of intensive care unit stay and the number of laparotomies. In a study by Gönüllü et al. [9], in which the efficacy of temporary abdominal closure with BB and the risk factors of survival were evaluated in patients treated for secondary peritonitis, the mortality rate of 37 patients in whom a BB was used was 43.2%, and it was concluded that a high Apache II score and the performance of many re-laparotomies was related to a high mortality rate.

Various surgical techniques and materials are used for the repair of the abdominal wall defect that develops following BB application. These include polypropylene, polytetrafluorethylene (PTFE) graft, composite materials, and biological materials [10,13–15]. As the number of re-operations increases, the chance of primary fascial closure decreases [13–20]. In the

current study, primary fascial closure was able to be applied to 5 (38.4%) of the 13 surviving patients. For patients where primary closure was not possible, closure with dual mesh (polyester with absorbable collagen film) was preferred. In the final operation when the abdomen was accepted as clean, dual mesh of the appropriate dimensions was used. No major complications developed in the follow-up periods of the patients.

In this study of BB applications, the factors related to patient mortality were found to be advanced age, a diagnosis of acute mesenteric ischaemia, high Apache II score, the development of cardiac failure, and the development of respiratory failure.

## Conclusions

BB application is an easy and low-cost method for temporary closure of the abdomen. In patients to whom it was applied, high mortality rates were seen related to the diagnosis, the Apache II score, age, and organ failure.

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