CIR ESP. 2011;89(6):379–385

CIRUGÍA ESPAÑOLA

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Original Article

Contained Laparostomy With a Bogota Bag. Results of Case Series

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ARTICLE INFORMATION

Article history:
Received June 14, 2010
Accepted January 4, 2011

Keywords:
Contained laparostomy
Bogota bag
Relaparotomy
Abdominal surgery
Surgical damage control
Morbidity

A B S T R A C T

Introduction: The «Bogota bag» (BB) is one of the options for contained laparostomy (CL). The aim of this study was to report the procedure associated hospital morbidity (PAHM) in patients undergoing relaparotomy followed by a laparostomy using the BB.

Material and method: Between 2002 and 2008, a prospective series of patients who underwent relaparotomy at the Hospital Hernán Henríquez, Temuco (Chile) was evaluated. The main end point was "development of PAHM". Secondary end points were: indications of the CL, time to first change of the BB, type of abdominal wall repair, hospital mortality and development of ventral hernia. Descriptive statistics were used, with the calculations of percentages and measures of central tendency and dispersion.

Results: The BB was used in 86 patients (median age of 53 years, 63% female). The PAHM was 38% (surgical-site infection and enterocutaneous fistula). The most frequent indication of CL was intra-abdominal sepsis (60%). The median time until the first change of the BB, the time period between surgical operations, and the time until removal of the BB were 65 hours, 2 days and 9 days, respectively. Laparostomy was repaired exclusively with skin, fascial closure or dermal-epidermal graft in 50, 39 and 10%, respectively. Inhospital mortality was 12%. Sixty percent of the patients developed a ventral hernia within a 48 month follow-up.

Conclusions: CL with a BB is associated with a high rate of PAHM and delayed complications.

Laparostomía contenida con bolsa de Bogotá. Resultados de una serie de casos

Palabras clave:
Laparostomía contenida
Bolsa de Bogotá

R E S U M E N

Introducción: Una opción de laparostomía contenida (LC) es la «bolsa de Bogotá» (BB). El objetivo de este estudio es comunicar los resultados observados en una serie de pacientes relaparotomizados con LC utilizando la BB, en términos de morbilidad hospitalaria asociada al procedimiento (MHAP).

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Relaparotomía
Sepsis abdominal
Cirugía de control de daños
Morbilidad

Material y método: Serie de casos prospectiva de pacientes relaparotomizados en el Hospital Hernán Henríquez de Temuco, entre 2002 y 2008. La variable resultado fue «desarrollo de MHAP». Otras variables de interés fueron: indicaciones de la LC, tiempo hasta el primer recambio de la BB, periodicidad de las intervenciones quirúrgicas, tiempo hasta la retirada de la BB, tipo de reparación de la pared abdominal, mortalidad hospitalaria y desarrollo de hernia incisional. Se utilizó estadística descriptiva; con cálculo de porcentajes, medidas de tendencia central y dispersión.

Resultados: En el período de estudio, se utilizó la BB en 86 pacientes (63% eran de género femenino), con una mediana de edad de 53 años. La MHAP fue 38% (infección de sitio operatorio y fístula enterocutánea). La indicación más frecuente de LC fue sepsis intra-abdominal (60%). Las medianas del tiempo hasta el primer recambio de la BB, periodicidad de las intervenciones quirúrgicas y tiempo hasta la retirada de la BB fueron 65 horas, 2 días y 9 días, respectivamente. La reparación de la laparostomía fue con cierre de piel exclusivo, cierre aponeurótico o injerto dermoepidérmico en 50, 39 y 10%, respectivamente. La mortalidad hospitalaria fue 12%. Tras un seguimiento de 48 meses se verificó que el 60% de los pacientes desarrollaron hernia incisional.

Conclusiones: La LC con BB se asocia a una frecuencia considerable de MHAP y complicaciones tardías.

Introduction

Contained laparotomy (CL) is a surgical technique that offers advantages over abdominal closure in patients who may require a relaparotomy (RL). Among these advantages are the following: direct and continuous inspection of the abdominal viscera, easy access to the peritoneal cavity, adequate drainage, decompression and better perfusion, and improved lung mechanics. In addition, it prevents injury to the abdominal wall, secondary to frequent RL. However, procedure-associated hospital morbidity has been attributed to this practice.[1-3] In the clinical setting, RL can be applied under the criteria of relaparotomy on demand (RLD) or programmed relaparotomy (PRL).

CL is a RL option indicated as a therapeutic tool in addition to the standard therapy in subgroups of patients with abdominal sepsis, damage control surgery for abdominal trauma and as second-look for suspicion of visceral viability. In these scenarios, CL can be applied using alternatives such as simple skin closure using different types of sutures or even towel clamps; the Bogota Bag (BB), absorbable and nonabsorbable mesh; and vacuum-assisted closure (VAC).[1-3] However, BB as described in 1984 by Borraez is still one of the most used alternatives, due to its low cost and wide availability.[4,5]

This report was written following the STROBE statement guidelines for reporting results of observational studies.[6,7]

The aim of this study was to communicate the procedure-associated hospital morbidity (PAHM) of a series of on-demand relaparotomised patients with the CL technique using a BB.

Material and Method

Study design

Prospective case series.

Centre

The study was conducted in the *Servicio de Urgencias* (Emergency Unit) of the Hospital Hernán Henríquez Aravena de Temuco, between January 2002 and June 2008. The follow-up cut-off point was in July 2009.

Participants

A non-probabilistic sample of consecutive cases of relaparotomised patients. All of them had firstly undergone an emergency operation. Patients undergoing surgery due to septic complications of acute pancreatitis were excluded.

Treatment

Drainage of the septic focus or damage control, leaving a CL with a BB to control for peritonitis and decompression of intra-abdominal pressure. After controlling the infection process, the abdominal wall was closed (Figure 1, Figures 1a and 1b). All patients had the necessary technical support in the intensive care unit.

Contained Laparotomy Technique

Having controlled the septic focus or lesions found, the peritoneal cavity was carefully cleaned and a BB installed.

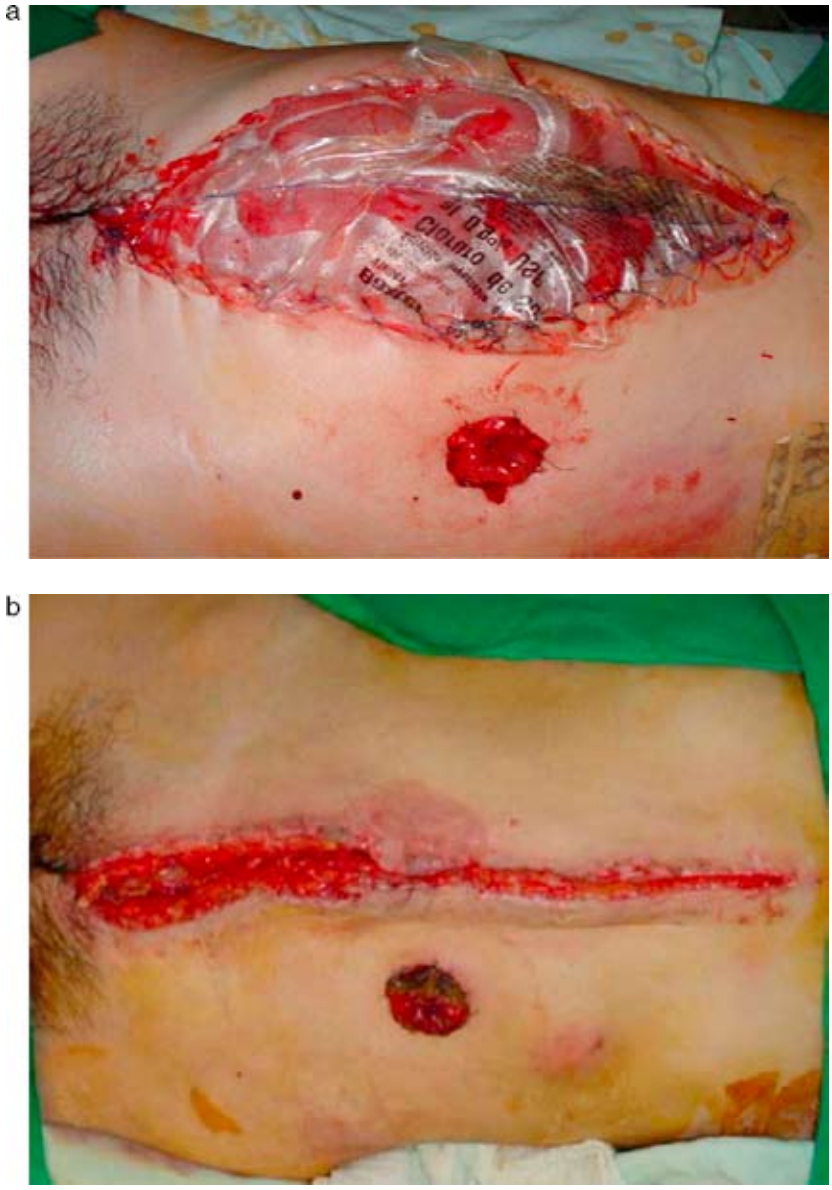

Figure 1 – a) Patient with perforated colon cancer and secondary stercoral peritonitis, where CL was performed using BB. A tense abdomen was seen at the end of the first surgery, with loop oedema and BB stitched to the skin. b) After a week of surgical treatment and three surgical cleans, tension-free complete closure of the abdomen was achieved.

The procedure consisted of leaving a polyethylene device obtained from a sterile bag of normal saline irrigation within the abdomen, covering the entire viscera (below the parietal peritoneum), followed by a similar device sutured to the free edges of the skin with continuous nylon-000 (Figure 1a). This procedure was repeated with each operation, and the aforementioned devices changed.

Study Protocol

After the laparotomy and subsequent indication for CL with BB, the patients were monitored during their hospital stay, and followed up after discharge via clinical and laboratory tests at 1, 6, 12, 24, and 36 months, with a minimum follow-up period of 12 months.

Variables

The main end point was "PAHM development," measured at least 12 months after the closure of the patient's abdomen (this was considered dichotomous, i.e., either present or absent). Other variables of interest were indications for CL, time to the first BB replacement, the time period between surgical operations, time to withdrawal of the BB, type of abdominal wall repair, hospital mortality and development of ventral hernia.

Bias

Both on admission and at the time of the clinical tests, any bias was reduced with a complete follow-up of patients in this series. In addition, a masked data collection was performed.

Table 1 – Comorbidity of Patients in the Study.

Variable	No. of Cases (86)	%
Associated disease,%		
Disease-free	54	62.8
COPD	19	22.1
Heart disease	5	5.8
Diabetes mellitus	4	4.7
Heart disease and diabetes mellitus	3	3.5
Chronic renal failure	1	1.2

COPD indicates chronic obstructive pulmonary disease.

Sample Size

Sample size was not considered, as it was a descriptive and observational study.

Statistical Methods

The data were analysed with a Stata 9.0/SE® program (from StataCorp, College Station, Texas, 77845, USA). After performing an exploratory data analysis, a descriptive statistical analysis was used with a calculation of percentages, measurements of central tendency and deviation.

Ethics

The ethical guidelines for research in humans were followed, and the data treated confidentially, as well local rules on the treatment of clinical data being followed.

Funding

This study did not have formal sources of funding.

Results

During the study period, CL using BB was applied in 86 patients with a median age of 53 years (range: 25-87), with 54 of the patients (62.8%) being female.

There were 32 patients (37.2%) suffering from a concurrent illness. The median APACHE II score was 12 (4-30). Some clinical characteristics of the patients are shown in Table 1.

The most frequent indications for CL were intra-abdominal collection secondary to a septic process in 52 cases (60.5%) and damage control surgery for trauma in 13 cases (15.1%), see Table 2.

PAHM rate was 38.4%, with aetiology being: superficial surgical site infection in 16 cases (18.6%), deep surgical site infection in 6 (7.0%) and development of enterocutaneous fistula in 11 (12.8 %).

The median time until the first BB change, the time period between surgical operations, and time to withdrawal of the BB were 65 hours (16-144), 2 days (1-7) and 9 days (2-100), respectively. The median number of reoperations in all patients was 3 (1-7).

The type of laparotomy repair was exclusive skin closure, fascial closure, and dermo-epidermal grafting in 43 cases (50%), 34 cases (39.5%) and 9 cases (10.5%), respectively.

With a median follow-up of 48 months (12-91), it was found that 60.5% of patients developed a ventral hernia.

Hospital mortality was 10 (11.6%), due to multi-organ failure in all cases.

Discussion

The aim of RLD is to re-operate only when it seems that it would be of benefit, such as in situations where a clinical deterioration or persistent lack of improvement

Table 2 – Indications for CL and BB in Patients Under Study.

Variable	No. of Cases (86)	%
*Intra-abdominal sepsis**	52	60.5
Diffuse appendicular peritonitis	21	24.5
Peritonitis due to perforated diverticulitis	15	17.4
Peritonitis due to perforated colon cancer	11	12.8
Peritonitis due to perforated sigmoid volvulus	5	5.8
Damage control surgery due to trauma	13	15.1
Penetrating abdominal trauma due to stabbing	6	7.0
Blunt abdominal trauma	5	5.8
Penetrating abdominal trauma due to gunshot	2	2.3
Others	21	24.4
Abdominal compartment syndrome	10	11.6
Necrotising fasciitis	5	5.8
Mesenteric ischaemia	3	3.5
Reconstructive colon surgery due to trauma	2	2.3
Bowel resection due to tuberculosis	1	1.2

*As a result of intra-abdominal collection due to sepsis.

is verified over time.[8] Nevertheless, one disadvantage it has is a delay in diagnosis and treatment of collections or intra-abdominal complications.[9] However, it has been reported that proper selection of patients, for example with the use of abdominal computed tomography (CT), helps prevent potential damage from a delay in re-intervention, due to adequate monitoring and a consequent reduction in the number of operations.[10-12] Furthermore, patients undergoing this type of procedure may have acute renal failure, which limits both the use and performance of abdominal CT, due to contrast media not being used, which may lead to discarding the option of managing the patient with the abdomen closed for RLD.

Most studies relating to RL in its various options have a number of limitations, both technical (hospital experience, heterogeneity of patients, process standardisation, indication of relaparotomy, CL type, technique and use of BB, etc.) and methodological (low evidence level design, participant selection criteria, small sample size, lack of control for confounding variables, etc.) Nevertheless, there is some evidence that is worth mentioning:

1) There is evidence supporting the use of RLD against PRL. One of the first studies reported was a case-control study, published by the peritonitis study group of the European Surgical Infection Society, which included patients with intra-abdominal infections from 18 hospitals in Austria, Germany and Switzerland. It found that RLD was better than the programmed form in terms of postoperative multiple organ failure and infectious complications[2] (evidence level 3b). Later, an observational study, also on peritonitis patients, confirmed that survival in hospital and after two years was higher in patients treated with RLD, compared with PRL[13] (evidence level 4). Also, in a clinical trial of emergency patients laparotomised due to secondary peritonitis in 7 Dutch hospitals between 2001 and 2005, it was found that those patients who underwent RLD had a lower percentage of reoperations, length of hospital stay and intensive care with respect to the PRL-treated group, thereby reducing the costs involved by 23%[8] (evidence level 2b). Furthermore, there is a systematic review of observational studies that included a total of 1266 adult patients with secondary peritonitis, which concluded that RLD showed a tendency towards a protective effect compared with PRL, regarding the hospital mortality variable. However, the heterogeneity of the studies did not allow for any definitive conclusions[14] to be drawn (evidence level 2b).
2) Also, there is evidence supporting the indication for CL in patients with trauma, as it minimises the risk of developing abdominal compartment syndrome in damage control surgery[15] (evidence level 4).
3) There is also evidence suggesting no significant differences between the use of meshes and the VAC system. In a clinical trial in patients with peritonitis, it was found that both options are equivalent as a method for covering and closing the abdominal wall[16] (evidence level 2b). In the same vein, an observational study concluded that the VAC system is effective[17] (evidence level 4).
4) There is some evidence based on case series, which supports the use of the BB as an alternative to CL in patients with secondary peritonitis[4,5,18] (evidence level 4). Moreover, in a retrospective cohort study conducted on emergency patients laparotomised due to abdominal trauma in a trauma centre I, which compared patients with fascial closure, skin closure and BB, it was found that those with fascial closure had a higher percentage of compartment syndrome, respiratory distress and multiple

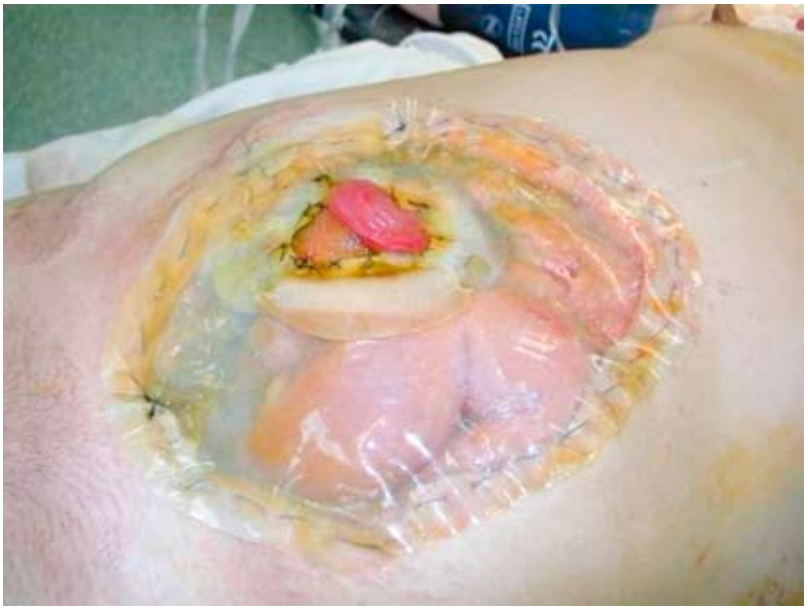

Figure 2 – Patient who suffered a blunt abdominal trauma with multiple injuries. He underwent damage control surgery that included a CL using BB and a floating stoma maturing directly on the BB. Once the vital parameters were optimised, a re-intervention was performed and the ostomised intestine was anastomosed, thus preventing a formal stoma.

organ failure than subgroups in which skin closure and BB was used[15] (evidence level 4).

5) Some prognostic factors have been identified, such as age, APACHE II score, the presence of hypoalbuminaemia, heart failure, multiple organ dysfunction syndrome, colonic peritonitis and the presence of prolonged symptoms.[19] Existing studies are difficult to compare, because the study populations are not very homogeneous, simultaneously including patients with peritonitis without multiple organ dysfunction, severe peritonitis and sepsis. Therefore, no definitive conclusions on the therapeutic management of these patients were obtained[20] (evidence level 4).

In our experience, the fact that 29.1% of patients had some coexisting condition, the median APACHE II score was 12 and the most frequent indications for CL were intra-abdominal sepsis and damage control surgery for trauma may lead to them being variables associated with high PAHM (38.4%), especially if this is mainly related to septic complications (surgical site and deep infections). In fact, due to the severity of some patients, on three occasions we performed a floating stoma that matured directly on the BB (Figure 2).

With regard to the CL technique employed, it is important to note the use of the polyethylene device left below the parietal peritoneum, as this reduces adhesion between the viscera and prevents adhesion between the viscera and parietal peritoneum. In one initial experience, when only the external polyethylene device was used (attached to the free edges of the skin), we observed various adhesion processes that made it much more difficult to perform a re-operation, even to the point of producing intestinal injuries with subsequent fistula formation. This is what led to the need to change this initial technique.

For indications or criteria used to leave the abdomen open in septic patients, it is important to emphasise that these were patients with advanced acute peritonitis, whose source of infection was difficult to eradicate with a single intervention. In other words, there was excessive pus and necrotic material spread throughout the peritoneum which could not be removed in one procedure. Likewise, peritonitis causes oedema which, associated with the dynamic resuscitation required by these patients, causes increased intra-abdominal pressure that may worsen with premature closure of the abdominal wall.

The time to the first BB replacement, the time period between surgical operations to withdrawal of the BB and the number of reoperations in all patients were similar to previously published series.[18,21]

Regarding the type of abdominal wall repair, one case series described the need to repair with a mesh, with dermo-epidermal graft and even with skin muscle flaps in 11%, 9%, and 9% of cases, respectively. In spite of this, 7% of ventral hernias were found.[18] In another series, a primary closure and the application of a polyglactin mesh was used pending granulation and eventual dermo-epidermal graft in 55.4% and 22.3%, respectively.[17]

In this scenario, the high prevalence of ventral hernia found in our experience (60.5%) can be explained firstly because it was not possible to close the fascia, apply mesh nor form flaps; and, secondly, due to the extensive follow-up time and thoroughness with which all patients were followed up.

Observed mortality was low compared with other previously published series (11.6% vs 21%-33%[8,13,17-19,22]). However, in a case-control study comparing mortality among patients subjected to RLD and PRL, it became clear that mortality was 13%,[2] in the group of subjects treated with RLD, which is similar to our findings.

Because this is an observational study, there was no statistical adjustment for potential confounding variables.

Finally, we can conclude that RLD with CL using BB has precise indications, and its use is often associated with considerable PAHM and delayed complications. This must be considered in the context of the type of patients involved, which also must be taken into account when indicating this option. This is due to the surgical criteria involved in this decision, where the surgeon's experience and resources available to the surgical centre can play a fundamental role in decision-making. In light of current evidence, RLD is presented as the best therapeutic alternative for patients who will require a RL; and special factors should be considered from case to case, regarding the decision to keep the abdomen open or closed. The morbidity in this series was similar to that reported in the literature.

Conflict of Interest

The authors affirm they have no conflict of interest.

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