

Our results in temporary closure techniques for the open abdomen

Nuestros resultados en técnicas de cierre temporal del abdomen abierto

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ABSTRACT

Introduction: The management of the abdominal wall in open abdomen (OA) cases represents a challenge for general surgeons. Several techniques and strategies have been introduced, yielding promising results. **Objective:** To describe the temporary closure techniques used for the management of OA. **Patients and Methods:**

A retrospective, observational, descriptive, cross-sectional study with non-probabilistic sampling was conducted. Patients with OA were included, evaluating the techniques used for their management and temporary closure, from March 2023 to February 2024, at the Second Chair of Surgical Clinic. **Results:** A total of 28 patients met the inclusion criteria, of whom 77 % were men and 23 % were women. The average age was 49 years. The techniques used were: open abdomen with Bogotá bag and vacuum-assisted closure (VAC) in 23 cases, dynamic traction with mesh and VAC in 3 cases, and dynamic traction with transparietal retention sutures and VAC in 2 cases.

Definitive closure of the abdominal wall was achieved in only 4 cases, while in another 4 cases, skin approximation was performed. In 16 cases, closure occurred through secondary intention healing. The mortality rate was 14.2 %. **Conclusion:** The most frequently used temporary closure technique for OA management was the Bogotá bag combined with vacuum-assisted closure. Abdominal wall closure was achieved in 4 patients. 4 deaths were recorded.

Key words: Open abdomen, Temporary closure, Bogotá bag.

RESUMEN

Introducción: El manejo de la pared abdominal en el abdomen abierto (AA), constituye un reto para el cirujano general, se han introducido varias técnicas y estrategias con resultados alentadores. **Objetivo:** Describir las técnicas de cierre temporal para el manejo del AA en la Segunda Cátedra de Clínica Quirúrgica del Hospital de Clínicas UNA de marzo 2023 a febrero 2024. **Pacientes y método:** Estudio retrospectivo, observacional, descriptivo, de corte transversal, con muestreo no probabilístico, fueron incluidos pacientes portadores de AA, las técnicas empleadas para su manejo y cierre temporal, de marzo 2023 a febrero 2024, en la II Cátedra de Clínica Quirúrgica del Hospital de Clínicas de la UNA. **Resultados:** Un total de 28 pacientes cumplieron con los criterios de inclusión, de los cuales el 77 % eran hombres y el 23 % mujeres. La edad promedio fue de 49

años. Las técnicas empleadas fueron: abdomen abierto con bolsa de Bogotá y sistema de aspiración al vacío (VAC) en 23 casos, Tracción dinámica con malla y VAC 3 casos y Tracción dinámica con suturas de retención transparietales y VAC en 2 casos. El cierre definitivo de la pared abdominal se logró en solo 4 casos, mientras que en otros 4 se realizó el afrontamiento de la piel. En 16 casos, el cierre se llevó a cabo mediante cicatrización por segunda intención. La tasa de mortalidad fue del 14,2 %. **Conclusión:** La técnica de cierre temporal para el manejo del AA utilizada con mayor frecuencia fue la bolsa de Bogotá y sistema de aspiración al vacío. Se logró el cierre de pared en 4 pacientes. Se registraron 4 óbitos.

Palabras claves: Abdomen abierto, Cierre temporal, Bolsa de Bogotá.

INTRODUCTION

The open abdomen (OA) is defined as the separation of all layers of the abdominal wall, with controlled exposition of the entrails, after a laparotomy. This technique is employed in critical patients who require specialized handling, particularly in cases of abdominal sepsis, compartment syndrome risk and other conditions that compromise the patient's stability.

The main indications for OA include severe visceral edema, damage control, fecal peritonitis and the presence of large parietal defects, such as those usually present in patients with extensive burns.^{1,2}

Open abdomen (OA) is divided into three periods: initial, middle, and final.

During the initial period, the abdomen's opening is performed along with a temporary abdominal closure (TAC). Its main objectives are:

- Allow re-exploration of the abdominal cavity and performing cleanings if necessary.
- Decrease intra-abdominal pressure.
- Evaluate the vitality of inner organs.
- Prevent evisceration and protect abdominal organs, maintaining their temperature.
- Facilitate additional procedures, such as debridement or organ resections, while the patient stabilizes and reaches a general adequate state for definitive closure.³

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Temporal abdominal closure (TAC) entails a series of methods designed to protect abdominal entrails while the patient remains with an open abdomen (OA). Literature offers diverse TAC options, making it essential to choose the most adequate technique to maximize the abdominal wall's definitive closure and minimize associated complications.

Among the main complications that are to be avoided with adequate use of TAC are enteroatmospheric fistulas, intra-abdominal abscesses, frozen abdomen and planned hernias.³

The second treatment period corresponds to the phase in which the patient remains with the open abdomen (OA) without the possibility of definitive closure. During this time, the patient may be placed in the Intensive Care Unit (ICU) or in-patient room, depending on the clinical state. In this stage, it's possible that the patient requires multiple additional surgical interventions, including re-explorations, abdominal cleanings and adjustments in the temporary closure's handling, with the objective of preserving the viability of the organs and to prevent complications until sufficient stabilization for definitive closure is achieved.^{2,3,4}

The third treatment period starts when the patient's clinical and surgical conditions allow for the definitive closure of the abdominal wall.

Elapsed time between the first intervention and recovery varies significantly according to the open abdomen's (OA) indication and general patient state. In prolonged evolution cases, such as in abdominal sepsis patients, several complications may arise, such as:

- Retraction of the musculoaponeurotic system
- Loss of parietal domain
- Visceral edema
- Frozen abdomen formation

Thus, the closure strategy must adapt to the patient's evolution to minimize these complications and enhance functional and structural results of the abdominal wall.

Temporary abdominal closure (TAC) can be performed through static or dynamic techniques, with or without the use of negative pressure. However, handling guidelines based on evidence recommend the use of negative pressure due to the multiple benefits it offers to the patient's evolution.

Definitive closure depends on the patient's general state as much as it does on the abdominal wall's condition. In many cases, the scarring process occurs due to a second intervention, which can allow for planned hernias, requiring a future parietal fix.

The objective of the present study is to describe the temporary closure techniques used in open abdomen (OA) handling.

MATERIALS AND METHODS

Retrospective, observational, descriptive, cross-cut study, with non-probabilistic sampling, patients of both genders with OA, employed techniques in their handling and temporary closure were included, from March 2023 to February 2024, in the Clinical Surgery's 2nd Subject.

Data collection was done through clinical files' revision, and with the creation of a questionnaire to gather information with the study variables (age, gender, temporary closure technique, definitive closure technique, death) to be investigated in this work. All ethical and confidential principles were upheld.

RESULTS

28 patients were included, of which 77% were man and 23% were women. The average age was 49 years old.

The techniques employed were:

Table I. Distribution of Temporary Abdominal Closure (TAC)

Techniques

Technique	Patients (n)	Frequency (%)
Abdomen opened by Bogota's bag and vacuum-assisted closure (VAC)	23	82,1 %
Dynamic traction with mesh and VAC	3	10,7 %
Dynamic traction with trans-parietal sutures and VAC	2	7,2 %
TOTAL	28	100%

Definitive closure of the abdominal wall was achieved in 4 patients (14.3%), while in 4 cases (14.3%) only the skin closure was performed. In 16 patients (57.2%), closure was done through scarring by second intention.

The mortality rate was 14.2%.



Figure 1. Open abdomen with vacuum-assisted closure

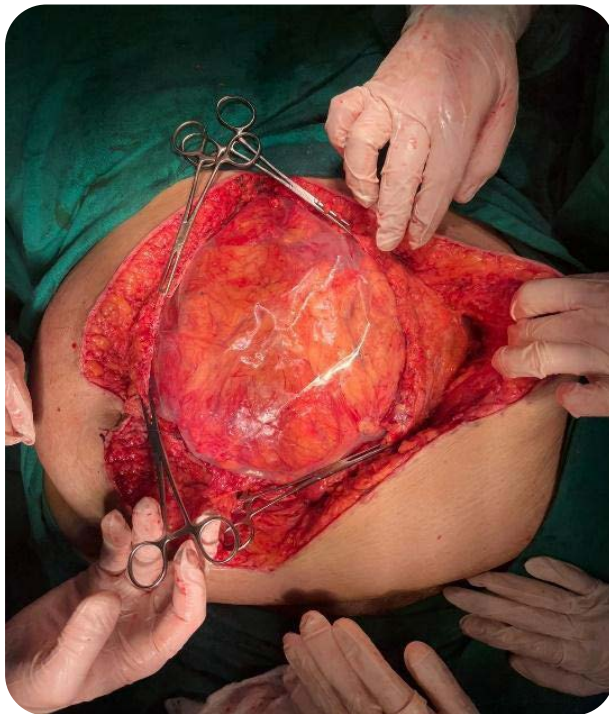


Figure 2. Abdomen opened by Bogota's bag



Figure 3. Dynamic traction with retention sutures and VAC

DISCUSSION

OA is defined as a clinical situation where the abdominal wall is left unclosed after surgical intervention, and it's handled with temporary abdominal closure (TAC). In certain situations, it's

due to an intervention or surgical complication, such as a partial resection of the abdominal wall due to necrotizing infection, trauma or tumor, but can be a technique employed to treat critical abdominal cases, situations in which the abdomen is left open due to several causes like damage control, or an important visceral edema just as published by Leppäniemi.⁷

Bjorck⁸ published a modification of the open abdomen's classification which characterizes the different stages according to the infection and fixing grade, from a clean, open, non-adhering abdomen to a frozen abdomen with one or more enteroatmospheric fistulas.

In some patients, open abdomen is used as a treatment technique and it's combined with some form of TAC, it can be divided into static or dynamic, with or without negative pressure, static temporary abdominal closures without negative pressure are found in the unused skin closure, the use of meshes that are already contraindicated due to fistula emergence, and Bogota's bag which is still a handling option for OA, used on a majority of patients in this investigation.^{2,3}

All patients in this study received vacuum pressure therapy, nowadays there are several studies that recommend the use of negative pressure, given its beneficial effects: such as reduction of intra-abdominal liquids, visceral edema's decrease, favoring the tissue granulation process, favoring irrigation and neovascularization, contamination control and elimination of intra-abdominal cytokines, as per the research done by Petersson, Tolonen and Cheatham.^{9,10,11,12}

Dynamic closure (DC) is a technique that consists in the progressive closure of the abdominal wall through a TAC that allows traction for abdominal wall's muscles towards the medium line, sequentially, during each surgical intervention until a primary fascial closure (PFC) is achieved, using, in some cases, a negative pressure system. A TAC that allows the association of dynamic closure and negative pressure counters the OA complications, given that it avoids muscle retraction and dominance loss from the beginning and allows the visceral blockade to develop in a controlled manner; this way, it allows for definitive closure of the abdominal cavity when conditions are met in most cases. In a small percentage of subjects submitted to this study were handled with dynamic traction, due to the learning curve to reproduce the techniques.^{13,14,15}

International guides recommend the use of TAC with dynamic techniques over static ones, performing definitive abdominal closure as soon as possible with the goal of reducing mortality, complications and in-patient stay related to OA, negative pressure techniques must always be used if available, performing means to prevent enteroatmospheric fistula, such as not applying negative pressure directly over the entrails, nor placing gauzes in contact or compressing with them, it's possible to apply Bogota's bag in low resource contexts, taking into account that a lower late fascial closure rate and higher intestinal fistula rate will occur, if there are no other available methods, or if a dynamic closure technique isn't an option, a TAC with negative pressure therapy in a static closure OA must be performed, similar to the results obtained in this study.^{15,16}

Lastly, it's important to perform an OA indication with much character, knowing all modern TAC methods, learning to properly use them, understanding what is fundamental for the multidisciplinary treatment of severe patients, favorable evolution will depend on antibiotic therapy run by isolated germ, correction of metabolic and systemic disorders such as anemia or hypoalbuminemia.¹⁷

CONCLUSION

The most frequently used temporary closure technique for OA handling was Bogota's bag and vacuum-assisted closure. Wall closure was achieved in 4 patients. 4 deceased were registered.

AUTHOR'S CONTRIBUTION

All authors participated equally in the creation of the study, data recollection and analysis, writing and approval of the manuscript's final version. All assume responsibility for the work's content.

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CONFLICT OF INTERESTS

Authors declare no conflict of interests.

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