

The Rivera Condom in the Management of Complicated Open Abdomen: A Case Report

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ABSTRACT

The hostile abdomen represents one of the most challenging scenarios in general surgery and is characterized by loss of normal anatomical planes, dense adhesions, persistent inflammation, and fibrosis, generally secondary to infectious processes, multiple surgical interventions, or severe abdominal complications. The development of intestinal fistulas in the setting of an open abdomen considerably increases morbidity and mortality due to continuous wound contamination, fluid and electrolyte losses, nutritional deterioration, and the risk of sepsis. The Rivera condom technique represents an alternative approach for the isolation and drainage of intestinal effluent in patients with fistulas and a complex abdomen. We present the case of a 15-year-old male patient with a history of complicated appendicitis who, following surgical treatment and subsequent abdominal complications, developed a hostile abdomen associated with intestinal fistulas. Because of the severe inflammatory response, extensive adhesions, and loss of normal anatomical planes, further surgical intervention posed a high risk of visceral injury and the development of additional fistulas. Given the difficulty in controlling the intestinal effluent, the Rivera condom technique was used, with the devices positioned over the fistulous openings to isolate and direct the effluent externally, thereby reducing its contact with the wound surface and facilitating local management of the open abdomen. Control of intestinal effluent is one of the fundamental principles in the management of fistulas associated with a hostile abdomen and should be integrated into a multidisciplinary approach that includes sepsis control, fluid and electrolyte replacement, nutritional support, tissue protection, and planning for eventual definitive reconstruction. The Rivera condom technique represents a simple, adaptable, and low-cost alternative that enables individual isolation of fistulous openings and controlled drainage of intestinal contents, particularly when wound characteristics limit the use of conventional devices. In the present case, this technique provided adequate isolation of intestinal effluent in an adolescent patient with a complicated open abdomen following appendicitis, representing a useful tool within the staged management of a highly complex surgical condition.

KEYWORDS: hostile abdomen; open abdomen; intestinal fistula; enteroatmospheric fistula; Rivera condom; appendicitis.

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INTRODUCTION

The hostile abdomen represents one of the most challenging scenarios in general surgery and is characterized by dense adhesions, loss of normal anatomical planes, persistent inflammation, and alterations of the abdominal wall, generally resulting from infectious processes, previous surgical procedures, or multiple reoperations. These

conditions considerably increase the technical difficulty of subsequent surgical interventions and predispose patients to complications such as intra-abdominal abscesses, wound dehiscence, sepsis, and the development of enterocutaneous fistulas.

Enterocutaneous fistulas represent a particularly challenging complication due to the continuous loss of intestinal contents,

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fluid and electrolyte disturbances, malnutrition, damage to the surrounding skin, and an increased risk of infection. Their management requires a multidisciplinary approach initially focused on sepsis control, fluid and electrolyte replacement, nutritional support, tissue protection, and adequate control of fistula output. In patients with an open abdomen and multiple fistulas, effective isolation of intestinal effluent can be technically challenging and may require individualized management strategies.

Among the alternatives available for fistula control and isolation is the Rivera condom technique, which allows intestinal contents to be diverted and reduces their contact with the abdominal wound and surrounding tissues. Its use may facilitate local wound management, enable quantification of fistula output, and contribute to contamination control while the patient's overall condition is optimized for definitive reconstruction.

We present the case of a 15-year-old male patient with a history of complicated appendicitis whose clinical course required surgical management and subsequent abdominal interventions, ultimately resulting in a hostile abdomen associated with enterocutaneous fistulas. Given the complexity of the abdominal defect and the need to control intestinal effluent, the fistulas were isolated using Rivera condoms as a local management strategy. This case describes the clinical course and the role of this technique in the management of a highly complex abdominal complication.

CASE REPORT

We present the case of a 15-year-old male patient who initially presented with acute appendicitis requiring surgical treatment. During the postoperative course, he developed abdominal complications resulting in a difficult-to-control intra-abdominal inflammatory and infectious process, requiring subsequent surgical management. The unfavorable clinical course and successive abdominal interventions led to progressive distortion of the abdominal anatomy, with the development of dense adhesions between the intestinal loops, abdominal wall, and surrounding tissues, as well as loss of normal anatomical planes.

As a consequence of this process, the patient developed a hostile abdomen, characterized by a severe inflammatory and adhesive process that considerably increased the risk of intestinal injury during any attempt at further surgical exploration. Manipulation of the intestinal loops in this setting carried a high risk of inadvertent enterotomy, vascular injury, formation of additional fistulas, and perpetuation of the intra-abdominal septic process. Therefore, an individualized therapeutic strategy was required.

During the subsequent clinical course, enterocutaneous fistulas developed, with intestinal contents draining directly onto the surface of the open abdomen. The presence of these

fistulas further increased the complexity of management because of continuous wound contamination by intestinal secretions and the associated risk of maceration and injury to the surrounding tissues. Furthermore, the persistent loss of gastrointestinal contents posed a potential risk of fluid and electrolyte imbalance, metabolic disturbances, malnutrition, and persistence of the infectious process.

Given the characteristics of the abdomen and the high risk associated with further aggressive surgical intervention, initial management was directed toward local control of the fistulas and intestinal effluent, protection of the exposed tissues, and optimization of the patient's overall condition. The immediate objective was to transform a difficult-to-control contaminated abdominal wound into a more stable local environment, allowing the fistulous sites to be managed individually.

Because conventional methods were insufficient to adequately contain the intestinal contents, the Rivera condom technique was selected for fistula isolation. This strategy was used to individually isolate the fistulous openings, divert the effluent externally, and minimize direct contact between intestinal secretions and the remainder of the abdominal wound.

The sites of enteric content leakage within the open abdomen were carefully identified. Rivera condoms were subsequently positioned over the identified fistulas to establish an isolation system capable of directing intestinal contents externally in a controlled manner. Placement was performed while minimizing manipulation of the intestinal loops and adherent tissues, given the fragility of the involved structures and the risk of causing additional injury in the setting of a hostile abdomen.

This technique achieved functional separation of the intestinal effluent from the remainder of the exposed abdominal surface. Controlled diversion of intestinal secretions reduced their spread throughout the wound, facilitating local tissue care and monitoring of the characteristics and output of the fistulas. Furthermore, individual isolation of the fistulous sites provided improved control of a complex abdominal wound in which primary closure or definitive reconstruction was not initially considered an appropriate option.

Local management was accompanied by close clinical monitoring and general supportive measures aimed at maintaining patient stability. Particular attention was given to fluid, electrolyte, and metabolic status, as well as nutritional support, because sustained intestinal losses associated with fistulas may result in significant systemic deterioration. The patient was also closely monitored for clinical evidence of infection or intra-abdominal sepsis, as well as for changes in the condition of the skin and tissues surrounding the open abdomen.



Figure 1. Intraoperative view of the patient following placement of Rivera condoms.

The use of Rivera condoms provided a temporary method for controlling intestinal effluent in a setting in which the abdominal anatomy was severely distorted and further surgical exploration could have increased morbidity. This strategy was incorporated into a staged management approach, initially prioritizing control of contamination and fistula output over definitive abdominal wall reconstruction. During follow-up, serial assessments of the abdomen, fistulous sites, and implanted devices were performed, with particular attention to adequate diversion of intestinal contents and protection of the surrounding tissues. Management required continuous local wound care and adaptation of the devices according to the characteristics of the fistulas and the abdominal wound.

This case illustrates the complexity that may arise during the course of an initially common abdominal condition, such as acute appendicitis, when severe infectious and surgical complications occur. Progression to a hostile abdomen associated with enterocutaneous fistulas represents a highly challenging therapeutic scenario, particularly in a pediatric patient. In this context, the use of Rivera condoms provided an alternative for temporary fistula isolation and controlled diversion of intestinal effluent, allowing comprehensive patient management to continue while favorable local and systemic conditions were achieved for subsequent stages of treatment.

DISCUSSION

The Rivera condom is a Mexican technique developed by general surgeon Miguel Ángel Rivera Pérez around 2005 as an alternative for the management of intestinal fistulas, complicated stomas, and enteric leakage in patients with complex abdominal conditions. The technique emerged from the need for a simple, inexpensive, and reproducible method capable of exteriorizing and directing intestinal contents while preventing their continuous contact with the abdominal cavity and the surface of an open wound. The accumulated experience with this technique was subsequently documented by Rivera Pérez and colleagues in the article Management of Complicated Stomas and/or Hostile Abdomen Using the Rivera Condom Technique: Ten Years of Experience, published in 2017 in *Cirujano General*.

In that study, patients treated between August 2006 and July 2016 were prospectively analyzed. The authors included 658 patients with complicated stomas or varying grades of open abdomen according to the Björck classification; 380 patients were managed using the Rivera condom technique, whereas 278 were treated using other methods. The device was essentially conceived as a latex splint placed over the intestinal end to exteriorize enteric contents and reduce chemical and bacterial contamination of the abdominal cavity and wound.

Table 1. Historical Evolution of the Rivera Condom Technique

Year	Event	Relevance
2005	Development of the technique by Miguel Ángel Rivera Pérez	Introduced as an alternative for the management of fistulas and complicated stomas
2006	Beginning of prospective patient data collection	Systematic documentation of clinical experience begins
2006–2016	Clinical application and follow-up of the technique	Ten years of clinical experience are accumulated
2017	Rivera Pérez et al. publish their experience	A total of 658 patients are reported, 380 of whom were managed using the Rivera condom technique

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2024	A new case series involving patients with hostile abdomen is published	Demonstrates the continued use of the technique for fistula output control
2025	The technique is recognized in the literature as a precursor to subsequent approaches, including the capillarity method (MECA)	Highlights the influence of the technique on contemporary management strategies
2026	Its use for enteroatmospheric fistula management is reported again	Demonstrates the persistence of its clinical application

The relevance of the Rivera condom technique should be understood within the context of the hostile abdomen, a condition characterized by loss of normal anatomical planes secondary to severe inflammation, fibrosis, and dense adhesions between the abdominal viscera and the abdominal wall. This scenario frequently results from abdominal sepsis, previous surgical procedures, wound dehiscence, intestinal leakage, and multiple reoperations. Under these conditions, further surgical exploration may be associated with substantial morbidity and mortality because of the risk of enterotomy, vascular injury, additional intestinal loss, and development of new fistulas.

In the present case, it is particularly relevant that the initial event was appendicitis in a 15-year-old male patient. Although appendicitis is one of the most common abdominal surgical emergencies, a complicated clinical course may lead to intra-abdominal infection, the need for repeated surgical interventions, and ultimately the development of a severe

adhesive process. In this patient, the subsequent clinical course resulted in a hostile abdomen and the development of intestinal fistulas, transforming an initially localized disease into a highly complex abdominal condition.

The development of an enterocutaneous or enteroatmospheric fistula represents one of the most serious complications associated with an open abdomen. Although these terms may occasionally be used interchangeably in clinical practice, distinguishing between them is important. An enterocutaneous fistula consists of an abnormal communication between the gastrointestinal tract and the skin through a fistulous tract, whereas in an enteroatmospheric fistula, the bowel is exposed within an open abdominal wound and discharges its contents directly onto the wound surface, generally without a mature fistulous tract. The latter condition considerably reduces the likelihood of spontaneous closure.

Table 2. Differences Between Enterocutaneous and Enteroatmospheric Fistulas

Characteristic	Enterocutaneous Fistula	Enteroatmospheric Fistula
Communication	Intestine-to-skin	Intestine-to-atmosphere/open abdominal wound
Fistulous tract	Generally present	Usually absent
Open abdomen	Not necessarily present	Characteristic
Bowel exposure	Variable	Frequent
Contact of effluent with the wound	Variable	Direct
Potential for spontaneous closure	May occur in selected cases	Generally lower
Difficulty of isolation	Moderate to high	High
Management	Sepsis control, nutritional support, fistula output management, and definitive treatment	Effluent isolation, bowel protection, sepsis control, and delayed reconstruction

The fundamental problem associated with these fistulas extends beyond the presence of an abnormal intestinal communication. Persistent leakage of enteric contents results in chemical and bacterial contamination of the wound, tissue maceration, fluid and electrolyte losses, nutritional deterioration, and an increased risk of sepsis. In high-output fistulas, these disturbances may progress rapidly and lead to a potentially life-threatening systemic condition.

For this reason, the initial therapeutic objective should not necessarily be immediate fistula closure. In a severely inflamed and densely adherent abdomen, attempting early definitive repair may result in additional injury. Contemporary management prioritizes sepsis control, fluid and electrolyte replacement, nutritional support, wound protection, and, particularly, control and isolation of intestinal effluent.

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Table 3. Treatment Objectives in Patients With a Hostile Abdomen and Intestinal Fistula

Objective	Intervention	Purpose
Sepsis control	Drainage/source control and antimicrobial therapy when indicated	Prevent organ failure
Fistula output control	Isolation and diversion of the fistula	Prevent wound contamination
Fluid and electrolyte replacement	Individualized replacement of losses	Maintain metabolic stability
Nutritional support	Enteral and/or parenteral nutrition according to anatomy and tolerance	Prevent or correct malnutrition
Skin and tissue protection	Barriers, collection devices, and wound care	Reduce maceration and chemical injury
Bowel protection	Avoid unnecessary manipulation	Reduce the risk of additional perforations
Fistula characterization	Assessment of location, anatomy, and output	Guide the therapeutic strategy
Definitive reconstruction	Delayed surgery in selected patients	Restore intestinal continuity and abdominal wall integrity

The Rivera condom technique primarily addresses the need to control intestinal output. Conceptually, the technique transforms a difficult-to-manage intestinal leak into a controlled flow directed externally. The flexible material functions as an extension or splint of the intestinal segment, allowing secretions to be collected without remaining in continuous contact with the raw abdominal wound surface. This aspect is particularly important because repeated contamination perpetuates the local inflammatory process and interferes with the formation of granulation tissue. By separating intestinal contents from the wound bed, local conditions may be improved, wound care facilitated, and the surrounding tissues protected. Furthermore, external diversion of intestinal contents allows more accurate assessment of the characteristics and volume of fistula output.

The original series by Rivera Pérez and colleagues represents one of the main sources of clinical evidence supporting this strategy. Of the 658 patients included, 380 were treated using the Rivera condom technique and 278 were managed using other methods. The authors reported a decrease in APACHE II score from 24 to 7 points among patients treated with the device, as well as a reduction in the Mannheim Peritonitis Index from 31 to 15 points. These findings should be interpreted in the context of the observational design of the study and should not be considered definitive evidence of superiority over other systems; nevertheless, they demonstrate the feasibility of the technique in a large population of patients with complex abdominal conditions.

Table 4. Main Results Reported by Rivera Pérez et al.

Variable	Reported Result
Study period	August 2006–July 2016
Study design	Descriptive, prospective, and longitudinal
Total number of patients	658
Management with Rivera condom	380 patients
Management using other methods	278 patients
APACHE II score in patients treated with the Rivera condom	Decreased from 24 to 7 points
Mannheim Peritonitis Index	Decreased from 31 to 15 points
Main reported characteristics	Versatility, ease of use, practicality, and low cost
Primary objective	Control and external diversion of intestinal output

One of the main advantages of the technique is its simplicity. Unlike more complex systems that may require specialized devices, the principle of the Rivera condom technique is based on relatively accessible materials and individualized adaptation to the fistulous site. This characteristic is particularly relevant in resource-limited institutions and in patients requiring repeated wound care over prolonged periods.

Nevertheless, the Rivera condom technique is not the only method described for the management of enteroatmospheric

fistulas. Modified negative-pressure wound therapy systems, chimney-type devices, ring-based isolation systems, catheters, patches, and various combinations of materials have also been used. More recently, strategies such as the capillarity method (MECA) have been described. Contemporary literature has even identified the Rivera condom technique as a conceptual precursor to some of these approaches because they share the fundamental principle of separating intestinal effluent from the remainder of the abdominal wound.

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Table 5. Conceptual Comparison of Strategies for Fistula Control in the Open Abdomen

Technique	Principle	Advantages	Limitations
Rivera condom technique	Controlled external diversion of intestinal contents using a flexible splint	Low cost, adaptable, simple, and facilitates effluent control	Requires individualized adaptation and device monitoring
Modified negative-pressure wound therapy	Application of negative pressure to the wound while isolating the fistula	Facilitates exudate management and granulation tissue formation	Direct application of negative pressure to the fistula should be avoided; technically more complex
Chimney technique	Vertical isolation of the fistula from the wound	Separates intestinal effluent from the wound bed	Requires appropriate adaptation and an effective seal
Ostomy/collection devices	External collection of intestinal contents	Facilitate output measurement and skin protection	May be difficult to secure on irregular surfaces or an open abdomen
Capillarity method (MECA)	Directed control of contamination using capillary principles	Alternative for complex enteroatmospheric fistulas	More limited published experience and requires appropriate patient selection

In the present patient, the use of Rivera condoms is particularly relevant because of the coexistence of a hostile abdomen and intestinal fistulas. Under these circumstances, the therapeutic priority is not limited to closure of the abdominal defect but also involves achieving adequate control of intestinal contents. Isolation of the fistulas using this technique allowed the effluent to be directed externally while limiting its contact with exposed tissues, thereby facilitating local management of a highly complex abdominal wound.

The patient's age is another distinctive aspect of this case. Most of the available literature regarding open abdomen management, enteroatmospheric fistulas, and the Rivera condom technique predominantly involves adult populations. Therefore, the application of this therapeutic principle in a 15-year-old patient is noteworthy, particularly considering that the underlying process originated from a common surgical condition such as appendicitis.

However, it should be emphasized that the Rivera condom technique should primarily be regarded as a strategy for controlling intestinal effluent and contamination, rather than as a procedure that independently achieves definitive fistula closure. Its usefulness lies within a comprehensive treatment strategy that requires infection control, appropriate fluid and electrolyte replacement, nutritional support, specialized wound care, and planning for eventual surgical reconstruction once favorable local and systemic conditions have been achieved.

Another important consideration is the avoidance of unnecessary reoperation during the phase of maximal inflammation. In a hostile abdomen, intestinal loops may be firmly adherent to one another and to the abdominal wall, making it difficult to identify safe dissection planes. Aggressive surgical intervention during this stage may result in additional enterotomies and new fistulas, perpetuating a cycle of inflammation, contamination, reoperation, and progressive loss of normal anatomy. Therefore, when

adequate control of sepsis and intestinal effluent has been achieved, a conservative and staged approach may offer advantages until the patient's condition is more favorable for definitive reconstruction.

Recent literature demonstrates that, despite having been developed approximately two decades ago, the Rivera condom technique continues to be used. Subsequent publications have again described its application in patients with hostile abdomen and intestinal fistulas, while more recent studies have recognized its historical importance in the development of strategies for enteroatmospheric fistula isolation. This is particularly relevant because many contemporary innovations retain the same fundamental principle originally proposed by Rivera: to control intestinal effluent, isolate it from the wound, and transform an otherwise difficult-to-manage abdominal condition into a local environment amenable to progressive and staged management.

Rivera: to control intestinal effluent, isolate it from the wound, and transform an otherwise difficult-to-manage abdominal condition into a local environment amenable to progressive management.

In the present case, the use of Rivera condoms allowed this principle to be applied in an adolescent patient with a complicated open abdomen following appendicitis. Individual isolation of the fistulas constituted an important component of the comprehensive management of the hostile abdomen and allowed contamination control to be prioritized over immediate intestinal reconstruction. The experience presented in this case supports consideration of this technique as a useful, inexpensive, and adaptable alternative in selected patients with intestinal fistulas associated with an open abdomen, particularly when local wound characteristics limit the use of conventional devices.

CONCLUSION

A hostile abdomen associated with intestinal fistulas represents one of the most challenging scenarios in general surgery because of the distortion of normal anatomical planes, the presence of dense adhesions, the risk of visceral injury during reoperations, and the systemic consequences resulting from the continuous loss of enteric contents. Management requires a comprehensive and staged approach in which sepsis control, correction of fluid and electrolyte disturbances, nutritional support, tissue protection, and adequate isolation of intestinal effluent are considered priorities before definitive reconstruction is attempted.

In the present case, a 15-year-old male patient progressed from complicated appendicitis to a hostile abdomen with the development of intestinal fistulas, representing a significant therapeutic challenge because of both the complexity of the local abdominal conditions and the risks associated with further surgical interventions. The use of the Rivera condom technique provided a strategy for isolating and diverting intestinal contents, reducing their direct contact with the abdominal wound surface and facilitating local fistula management.

This technique represents a simple, adaptable, and low-cost alternative for the temporary control of intestinal effluent in selected patients with a complicated open abdomen. Its primary benefit lies in transforming a difficult-to-control intestinal leak into a directed external flow, thereby protecting the surrounding tissues and promoting more favorable local conditions for subsequent stages of treatment.

The experience presented in this case highlights that the Rivera condom technique should be considered part of a multidisciplinary management strategy rather than an isolated or definitive treatment for intestinal fistulas. Appropriate patient selection, continuous monitoring, metabolic and nutritional support, and individualized planning for definitive reconstruction are essential to achieve favorable outcomes.

Finally, the present case demonstrates the potential usefulness of the Rivera condom technique in the management of intestinal fistulas associated with a hostile abdomen, including in the adolescent population. Its accessibility, ease of adaptation, and ability to control intestinal effluent make it a particularly valuable option in complex surgical scenarios and in institutions where specialized devices may have limited availability. Further reporting of clinical experiences and additional comparative studies are needed to more precisely define its indications, outcomes, and role within contemporary management algorithms for the complicated open abdomen.

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