

Modified Endoluminal Vacuum Therapy for the Treatment of Colorectal Fistula: Experience from a Gastroenterology Unit in a High-Complexity Institution

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Abstract

Endoluminal vacuum therapy (Endo-Vac) may be a promising option for the endoscopic management of challenging gastrointestinal fistulas or perforations. However, one of the barriers to its implementation is the high cost associated with conventional systems. Consequently, modified techniques using readily available and lower-cost materials have been developed. This report describes the successful endoscopic closure of a colorectal anastomotic fistula using a modified Endo-Vac technique. Despite using materials different from those in conventional systems, this approach may represent an effective and lower-cost alternative for managing anastomotic complications, facilitating its implementation in settings with limited resources.

Keywords

Endoscopy, gastrointestinal fistula, surgical anastomosis.

INTRODUCTION

One of the most serious complications following intestinal anastomosis is anastomotic leak⁽¹⁾, with an incidence ranging from 1% to 24% in lower gastrointestinal tract surgery^(2,3). Various strategies exist for managing this complication, one of the most novel being endoluminal vacuum therapy (Endo-VAC), which combines the principles of endoscopy and vacuum therapy, allowing for a reduction in inflammation and stimulating the formation of granulation tissue. A fundamental aspect to consider for implementing this therapy is its cost, which has led to the development of alternative strategies to mitigate the economic impact.

Among these is modified Endo-VAC therapy, which uses low-cost and easily accessible materials and has shown promising results both in Latin America and worldwide. This report presents a successful case managed in northeastern Colombia, where modified Endo-VAC therapy was applied to treat a colorectal anastomotic leak following tumor resection surgery.

CASE REPORT

The case involves a 58-year-old male patient diagnosed with stage IIIA (T3N1M0) distal rectal adenocarcinoma, moderately differentiated, ulcerated, and infiltrating, with

a classic pattern. He underwent neoadjuvant treatment followed by surgical resection of the tumor in the extraperitoneal lower rectum, five centimeters from the anal verge. During the surgical intervention, a colorectal anastomosis was performed, and a protective ileostomy was created.

On the eighth day after surgery, the patient began presenting symptoms suggestive of a possible anastomotic leak, with fecaloid material in the drainage system located in the pelvic fossa, tachycardia, food intolerance, and postprandial abdominal distension. Furthermore, a notable increase in output through the ileostomy was observed. Although complete blood count results showed no leukocytosis, a significant elevation in acute-phase reactants was evident. Given these findings, the patient was jointly evaluated by specialists in Coloproctology, Internal Medicine, and Gastroenterology, who concluded that the patient had an anastomotic leak, probably associated with abdominal sepsis. An abdominopelvic computed tomography scan confirmed the presence of a small collection in the pelvic region, so broad-spectrum empirical antibiotic treatment was initiated, without considering percutaneous drainage necessary at that time. A watchful waiting approach was maintained for one more week, with a follow-up evaluation scheduled.

As the patient's course continued, a constant output through the ileostomy was observed; the ileostomy remained functional throughout the entire postoperative period, without bleeding, productive, and viable. However, due to the increased output, possible ileostomy failure was suspected, leading to a rigid sigmoidoscopy, which identified two fistulous orifices located four centimeters from the anal verge, with diameters of 8 mm and 15 mm, respectively (**Figure 1A**).

In view of these findings, it was determined that the patient was a candidate for modified Endo-VAC therapy aimed at closing the fistulous defects. For this purpose, a modified Endo-VAC device, fabricated in the Gastroenterology Unit using a 12 Fr nasogastric tube (**Figure 1B**), was introduced, applying a negative pressure of -80 mm Hg, with strict medical monitoring during the procedure.

After seven days, a new endoscopic study showed the persistence of both fistulous orifices, although signs of granulation tissue and a notable reduction in their diameters—now measuring 4 mm and 7 mm, respectively—were observed (**Figure 1C**). Given the reduction in the size of the orifices, it was decided to continue endoluminal vacuum therapy using a 10 Fr tube and a negative pressure of -80 mm Hg, with reevaluation scheduled for the following week.

In this new assessment by the Gastroenterology team, the fistulous orifices were observed with a considerable amount of granulation tissue. The decision was made to proceed with closure of the residual defect using three hemoclips (**Figure 1D**). The procedure was performed without complications, and the patient was discharged safely.

At the follow-up conducted two months after the aforementioned intervention, an adequate colorectal anastomosis was observed, with a visible suture line and no evidence of new fistulous orifices or additional complications. Based on these results, it was concluded that the patient had experienced complete resolution of his clinical condition.

DISCUSSION

This article describes the successful closure of a colorectal fistula in a patient who underwent resection for distal rectal adenocarcinoma, using modified Endo-VAC therapy. Two device exchanges resulted in partial closure of the defect, followed by the insertion of three clips to achieve complete fistula closure, with an adequate clinical course and outpatient follow-up.

Gastrointestinal tract surgery is a common procedure, and complications arising from these interventions must be managed appropriately and promptly. The occurrence of a colorectal anastomotic leak is one of the most serious complications patients can experience following intestinal surgery⁽⁴⁾. Its incidence ranges from 1% to 24% after lower digestive tract surgery^(2,3), which has a deleterious effect on both oncological prognosis and intestinal function⁽⁴⁾.

Despite advances in surgical technique and optimization of the patient's preoperative status, the risk of anastomotic leakage has not been completely eliminated⁽⁴⁾. Traditionally, such leaks have been managed surgically; however, the use of non-invasive techniques has increased in recent years. Among the management options for anastomotic defects is Endo-VAC therapy, which aims to reduce the potential impact of complications associated with localized sepsis, as well as the need for additional and more radical interventions⁽⁴⁾.

This therapy is based on the controlled introduction of a vacuum device via endoscopy, allowing for the application of gentle, continuous suction to the affected area of the gastrointestinal tract. Its mechanisms of action are diverse and include macrodeformation, which occurs when the applied suction pulls the edges of the defect, causing them to contract. Similarly, microdeformation initiates signaling cascades that culminate in the release of growth factors, which promotes cell proliferation, improves perfusion, increases neovascularization, and reduces local edema⁽⁵⁾.

Endo-VAC has been used in bariatric surgery, as well as in the management of esophageal, gastric, and duodenal perforations and fistulas; pancreatic fistulas; anal abscesses; colorectal defects; among others^(6,7). The technique has shown considerable success rates, with data from retrospective studies reporting 86% success for gastric defects, 100% for small bowel alterations, and 60% for colonic disorders⁽⁸⁾. In Colombia, the successful use of this the-

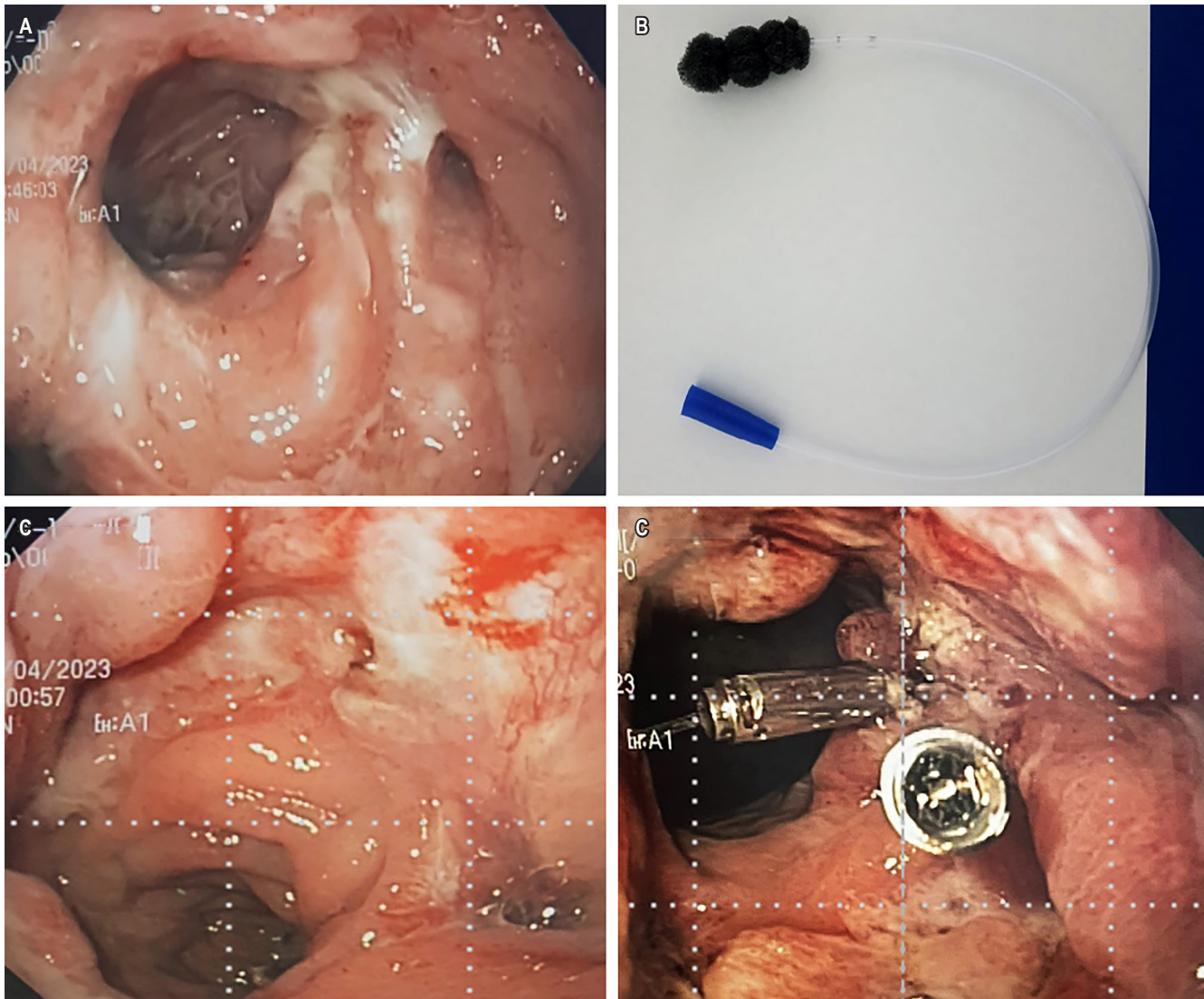


Figure 1. Endoscopic images of the clinical case. **A.** Endoscopic visualization of the colorectal fistula. **B.** Modified Endo-VAC device made with a 12 Fr nasogastric tube, with a sponge fragment at its tip, secured with a transfixing suture, at a pressure of -80 mmHg. **C.** Endoscopic follow-up after one week of management with the modified Endo-VAC system. **D.** Visualization of hemostatic clips following the use of the modified Endo-VAC system. Images property of the authors.

rapy has been documented for managing late postoperative colocolocutaneous anastomotic leak⁽⁹⁾.

The cost of Endo-VAC therapy is high. According to approximate data, a 25-day treatment with eight Endo-VAC device exchanges per patient has a total cost of approximately USD 10,188, equivalent to about COP 40 million⁽¹⁰⁾. In this context, the economic factor is a crucial aspect to consider when implementing this type of therapy in our setting. Since the pandemic, poverty in Latin America and the Caribbean has increased, rising from 24% to 26.5% in 2021. Furthermore, economic growth prospects for 2023 have been reduced to 1.4%⁽¹¹⁾.

The implementation of this technology can represent a significant challenge, not only for economic reasons, as mentioned previously, but also due to the potential lack of availability of specific devices in local markets. To address this issue, modifications to this therapy have been developed, using more economical and easily accessible materials, aiming to reduce production costs without compromising the efficacy of the original methods⁽⁴⁾.

Various reports have demonstrated the effectiveness of vacuum technology in treating patients with colorectal anastomotic leak, even using inexpensive and readily available materials⁽¹²⁾. One therapy that has gained relevance is

the modified form of Endo-VAC, developed by Dr. Diogo de Moura's group^(4,13-15). In this variant, the aim is to replace the polyurethane sponge originally used, which is manufactured in Germany and has a high cost for Latin American countries. This adaptation employs an open-pore film for the therapy, using low-cost materials.

The procedure consists of three fundamental steps:

1. Creation of the modified Endo-VAC device: The first step involves cutting a gauze in half to cover the fenestrated portion of the tube. The gauze is then wrapped around the fenestrated portion of the tube, completely covering the apertures. Subsequently, the gauze wrap is trimmed to match the size of the fenestrated portion of the tube, and the sponge is secured with suture.
2. Endoscopic testing of the device: The second step involves the endoscopic placement of the pre-prepared device.
3. Application of negative pressure: The third step consists of connecting the tube to suction to prevent device migration during endoscope withdrawal. Then, the connection of the modified Endo-VAC tube to the suction line connected to wall suction is sealed. Finally, a 20 G intravenous catheter is connected to the suction tube to maintain a negative pressure between 75 and 150 mm Hg^(12,13,15).

This technique has had multiple applications due to its easy adaptation and the low cost of the materials used, and it has demonstrated adequate safety and clinical success in most patients, with low complication rates⁽⁶⁾. As observed in the reported patient, it could be a valuable therapeutic option for those patients requiring Endo-VAC therapy in countries with economic constraints or when conventional therapy presents difficulties or complications.

CONCLUSION

This case illustrates the successful resolution of a colorectal fistula in a patient with distal rectal adenocarcinoma through the implementation of modified Endo-VAC therapy. Despite the economic and logistical challenges associated with adopting innovative technologies, this technique presents itself as a viable, economical, and effective alternative for the treatment of colorectal anastomotic fistulas. It can not only contribute to improved clinical outcomes but also optimize comprehensive patient care. Continued research and development of new strategies are essential to ensure effective management of complications and promote a more sustainable and accessible care model.

REFERENCES

1. Lee WS, Yun SH, Roh YN, Yun HR, Lee WY, Cho YB, et al. Risk factors and clinical outcome for anastomotic leakage after total mesorectal excision for rectal cancer. *World J Surg*. 2008;32(6):1124-9. <https://doi.org/10.1007/s00268-007-9451-2>
2. Matthiessen P, Hallböök O, Andersson M, Rutegård J, Sjö Dahl R. Risk factors for anastomotic leakage after anterior resection of the rectum. *Colorectal Dis*. 2004;6(6):462-9. <https://doi.org/10.1111/j.1463-1318.2004.00657.x>
3. Pinilla RE, Aramendiz MC, Williams E, Caycedo-Marulanda A. Endo-VAC customization for sinus/anastomotic-leaks/dehiscence after colorectal anastomosis. *Tech Coloproctol*. 2020;24(10):1095-1096. *Tech Coloproctol*. 2021;25(3):355. <https://doi.org/10.1007/s10151-020-02326-2>
4. de Moura DTH, de Moura BFBH, Manfredi MA, Hathorn KE, Bazarbashi AN, Ribeiro IB, et al. Role of endoscopic vacuum therapy in the management of gastrointestinal transmural defects. *World J Gastrointest Endosc*. 2019;11(5):329-344. <https://doi.org/10.4253/wjge.v11.i5.329>
5. Loske G, Rucktaeschel F, Schorsch T, Moenkemüller K, Müller CT. Endoscopic negative pressure therapy (ENPT) for duodenal leakage - novel repair technique using open-pore film (OPF) and polyurethane-foam drainages (OPD). *Endosc Int Open*. 2019;7(11):E1424-E1431. <https://doi.org/10.1055/a-0972-9660>
6. Ramírez Barranco R, Cañadas Garrido RA, Cáceres Escobar D. Terapia de vacío endoluminal (Endo-Vac) en el manejo de la fistula de anastomosis esofagagástrica. *Rev Colomb Gastroenterol*. 2022;37(1):83-9. <https://doi.org/10.22516/25007440.710>
7. Mencia MA, Ontiveros E, Burdick JS, Leeds SG. Use of a novel technique to manage gastrointestinal leaks with endoluminal negative pressure: a single institution experience. *Surg Endosc*. 2018;32(7):3349-3356. <https://doi.org/10.1007/s00464-018-6055-x>
8. Saavedra JEM, Carrillo CAT, Valbuena GLM. Outpatient closure in a late colo-cutaneous postoperative anastomotic leak managed with EVAC in Bucaramanga, Colombia. Case report. *Int J Surg Case Rep*. 2022;100:107737. <https://doi.org/10.1016/j.ijscr.2022.107737>
9. Ooi G, Burton P, Packiyathan A, Loh D, Chen R, Shaw K, et al. Indications and efficacy of endoscopic vacuum-assisted closure therapy for upper gastrointestinal perforations. *ANZ J Surg*. 2018;88(4):E257-E263. <https://doi.org/10.1111/ans.13837>
10. Banco Mundial. América Latina y el Caribe: panorama general. Banco Mundial; 2023 [consultado el 21 de agosto

- de 2023]. Disponible en: <https://www.bancomundial.org/es/region/lac/overview>
11. Kiko I, Nehring D, Ma T. Creation of a Custom Endoluminal Vacuum-Assisted Device for Salvage of Ileal Pouch-Anal Anastomotic Leak. *Cureus*. 2023;15(11):e49754. <https://doi.org/10.7759/cureus.49754>
 12. de Moura DTH, Hirsch BS, McCarty TR, Lera Dos Santos ME, Guedes HG, Gomes GF, et al. Homemade endoscopic vacuum therapy device for the management of transmural gastrointestinal defects. *Dig Endosc*. 2023;35(6):745-756. <https://doi.org/10.1111/den.14518>
 13. de Moura DTH, Hirsch BS, Do Monte Junior ES, McCarty TR, de Medeiros FS, Thompson CC, et al. Cost-effective modified endoscopic vacuum therapy for the treatment of gastrointestinal transmural defects: step-by-step process of manufacturing and its advantages. *VideoGIE*. 2021;6(12):523-528. <https://doi.org/10.1016/j.vgie.2021.08.002>
 14. de Moura DTH, do Monte Junior ES, Hathorn KE, de Medeiros FS, Thompson CC, de Moura EGH. Modified endoscopic vacuum therapy in the management of a duodenal transmural defect. *Endoscopy*. 2021;53(1):E17-E18. <https://doi.org/10.1055/a-1173-7282>
 15. de Moura DTH, do Monte Junior ES, Hathorn KE, Ribeiro IB, de Medeiros FS, Thompson CC, et al. The use of novel modified endoscopic vacuum therapies in the management of a transmural rectal wall defect. *Endoscopy*. 2021;53(1):E27-E28. <https://doi.org/10.1055/a-1173-7727>