

Covered intestinal endoprosthesis for the management of enteroatmospheric fistula, case report and review of the literature

Endoprótesis intestinal recubierta para manejo de fístula enteroatmosférica, reporte de caso y revisión de la literatura

Ediel O. Dávila-Ruiz*, Roberto A. García-Manzano, Alan Barker-Antonio, Elías Hernández-Cruz and Emmanuel López-Martínez

General Surgery Service, High Specialty Regional Hospital of Oaxaca, Oaxaca Ministry of Health, San Bartolo Coyotepec, Oaxaca, Mexico

Abstract

The management of fistulas is a challenge for surgeons, the enteroatmospheric fistulas are characterized by being superficial, high debit and surrounded by viscera or granulation tissue, with poor control of its excretion due to their anatomy. We describe an alternative approach to the management of enteroatmospheric fistulas, in a patient with a hostile abdomen and massive intestinal resection, selected for placement of a stent, as a rescue measure. Use of intestinal stent allowed fistula control and enteric feeding capacity, that substantially improves the quality of life.

Keywords: Enteroatmospheric fistula. Intestinal stent. Enterocutaneous fistulas. Intestinal endoprosthesis. Hostile abdomen.

Resumen

El manejo de la fístula es un desafío para los cirujanos. Las fístulas enteroatmosféricas (EAF) se caracterizan por ser superficiales, de alto gasto y rodeadas de vísceras o tejido de granulación, con un control deficiente de su excreción debido a su anatomía. Describimos un enfoque alternativo para el manejo de la fístula enteroatmosférica, en un paciente con un abdomen hostil y resección intestinal masiva, seleccionándolo para la colocación de stent como medida de rescate, permitiendo el control de la fístula y el inicio de la alimentación entérica, lo que mejora sustancialmente la calidad de vida.

Palabras clave: Fístula enteroatmosférica. Stent intestinal. Fístulas enterocutáneas. Endoprótesis intestinal. Abdomen hostil.

Introduction

The management of fistulas has been a challenge for surgeons since the beginning of surgical interventions in the gastrointestinal tract. There are multiple variants of fistulas and different treatments. Currently, conservative

management is the treatment of choice in low output fistulas, which allows spontaneous closure, avoiding surgical interventions. When conservative treatment fails or is not possible due to high output fistulas, such as enteroatmospheric fistulas, new techniques must be sought that allow management and closure of the fistula.

*Correspondence:

Ediel O. Dávila-Ruiz

E-mail: dredi13@gmail.com

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Enteroatmospheric fistulas are a subgroup of enterocutaneous fistulas that are characterized by being superficial, with high output, surrounded by viscera or granulation tissue, which causes poor control of output and leads to severe malnutrition in short periods due to its high output, electrolyte disturbances and sepsis¹⁻³.

If an enteroatmospheric fistula occurs in the context of a frozen open abdomen, it is classified as Björck 4 and the mortality rate is 42%, which has been reduced thanks to advances in surgical techniques and intensive care⁴.

An enteroatmospheric fistula can develop in the context of short bowel syndrome, which worsens the patient's prognosis. Short bowel syndrome is defined as the condition resulting from surgical resection or congenital disease, with inability to maintain energy, fluid-electrolyte, and micronutrient balance with a normal diet, requiring intravenous or parenteral supplementation. This complication may occur in 15% of patients undergoing intestinal resection, 75% of patients undergoing massive resection, and 25% of patients undergoing multiple resections. Patients with less than 180 cm of bowel are at risk^{5,6}.

In this case, emphasis is placed on the need to restore intestinal transit, with management of the output of the enteroatmospheric fistula through the use of an intestinal stent as a rescue measure^{7,8}. This measure is controversial since there are different results, but it can be a rescue treatment in protocolized patients in whom there is no possibility of further intestinal resections or surgeries, due to hostile abdomen, severe adhesive disease or short bowel^{9,10}.

We describe an alternative management of an enteroatmospheric fistula in a patient with open abdomen Björck 4, in the context of frozen abdomen and massive intestinal resection. A detailed search for the use of stenting as a rescue measure was carried out to offer a procedure that could favor early fistula control and closure by intestinal stenting. The following MeSH terms were used: *enteroatmospheric fistula*, *intestinal stent*, *enterocutaneous fistula*, *intestinal endoprosthesis* and *hostile abdomen*.

Clinical case

A 47-year-old male farmer from Oaxaca was referred from a second level hospital with a diagnosis of intestinal obstruction. Personal history: hypertension of 15 years of progress, under treatment with angiotensin II receptor blocker. Surgical history: emergency appendectomy 15 years ago with favorable resolution,

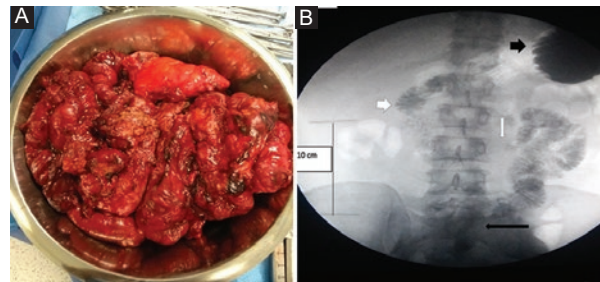


Figure 1. A: resected bowel. B: measurement of the intestine remnant, stomach (short black arrow), duodenum (short white arrow), Treitz angle (long white arrow), and leakage of contrast medium in the jejunum (long black arrow).

and exploratory laparotomy 5 years ago due to stabbing, without complications.

He begins his ailment on February 15, 2018 with abdominal pain, vomiting, nausea and inability to evacuate. Two days later he attends a second level hospital, is diagnosed with intestinal obstruction, and undergoes exploratory laparotomy, with findings of necrosis of 10 cm of jejunum, thus resection and end-to-end anastomosis are performed. With poor progress, he underwent surgery on the sixth day due to the obstruction, but only laparotomy with biopsy was performed and he was sent to a third level hospital for diagnostic protocol, initiation of total parenteral nutrition, and management of intestinal obstruction. He underwent a new operation on March 7 due to leakage of intestinal material in the lower third of the surgical wound, and multiple violin-string-like lacerations were evidenced in the antimesenteric wall of the intestine, secondary to a traumatic injury due to the material used (polypropylene) for the closure of the aponeurosis in the previous surgery, in addition to Zuhlke II-III adhesions. En bloc resection of the damaged bowel was decided (Fig. 1), leaving only a jejunum remnant 40 cm from the angle of Treitz and the entire colon. A jejunal-colonic anastomosis was performed with a GIA 80 mmHg stapler and the abdominal cavity was closed. Sepsis management was according to current guidelines.

On the third postoperative day, the patient presented leakage of intestinal material and surgery was necessary, with the following findings: severe Zuhlke IV adhesive disease, impossibility to dissect the jejunum due to firm adhesions to the sigmoid, and necrosis of the anterior aspect of the cecum. The necrotic edges were dissected, the anastomosis was remodeled, and drains were placed on the anterior and posterior sides of the anastomosis. In the postoperative period, there was



Figure 2. Jejunal-transverse anastomosis is observed.

evidence of leakage, and due to the impossibility of surgical treatment, it was decided to treat it as a high output fistula. Antisecretory therapy was started with omeprazole 80 mg daily infusion and loperamide 16 mg/day, as well as parenteral nutrition 2400 kcal/day and multivitamin supplementation. Intestinal transit was performed with water-soluble contrast medium to determine the amount of intestine remnant, which was of approximately 40 cm from the Treitz angle (Fig. 1). Moreover, a colon enema study was performed with water-soluble medium, verifying the permeability of the lower tract.

A third operation was decided at the third level hospital on April 9, dismantling the previous anastomosis, which presented a dehiscence of more than 70%. A right hemicolectomy was decided in order to prevent leakage due to the poor irrigation of the cecum remnant and ascending colon. Transverse-jejunal anastomosis was performed. It was not possible to separate the jejunum attached to the sigmoid colon (Fig. 2). On the fourth day, there was leakage of the anastomosis due to kinking in the sigmoid colon and increased pressure (Fig. 3). To limit contamination of the cavity, a vacuum-assisted closure (VAC) system was placed (Fig. 4), which allowed closure of

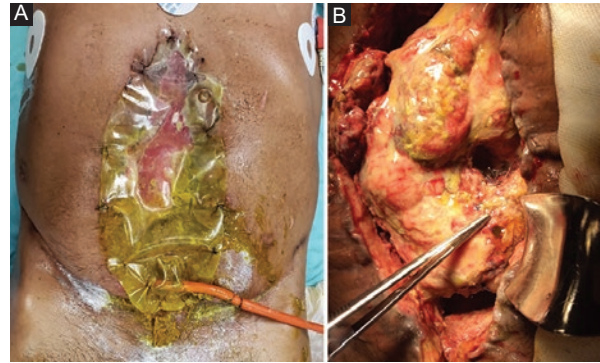


Figure 3. A: poor control of the leak. B: dehiscence of the anterior aspect of the anastomosis.

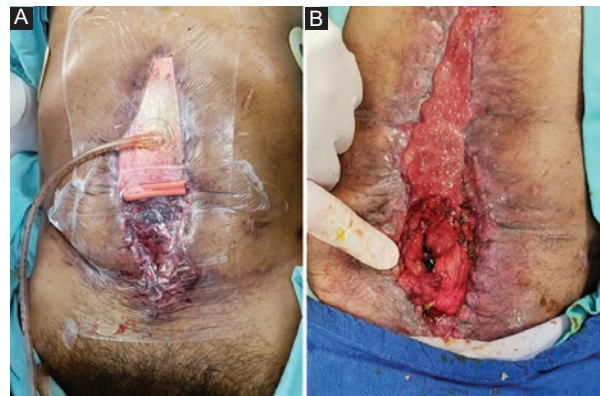


Figure 4. A: placement of VAC system. B: isolated enteroatmospheric fistula.

the midline wound in four VAC sessions, leaving only the anastomotic dehiscence as an isolated enteroatmospheric fistula. Due to the patient's condition (malnutrition, sepsis, fluid-electrolyte imbalance, hostile abdomen) further surgeries were not possible, due to high risk of perforation and devascularization. Isolation of the fistula helped to improve hemodynamic status and sepsis control. However, enteric losses were high, perpetuating fluid-electrolyte imbalance, malnutrition and malabsorption¹¹⁻¹⁴.

Surgical technique and indications for intestinal stent placement

In the context of the patient with enterocutaneous fistula and short bowel syndrome, the placement of a 36 × 100 mm covered stent (nitinol) was proposed to restore intestinal transit from the distal loop (jejunum) to the proximal loop (transverse colon), allowing fistula control, granulation from the intestinal edges and definitive

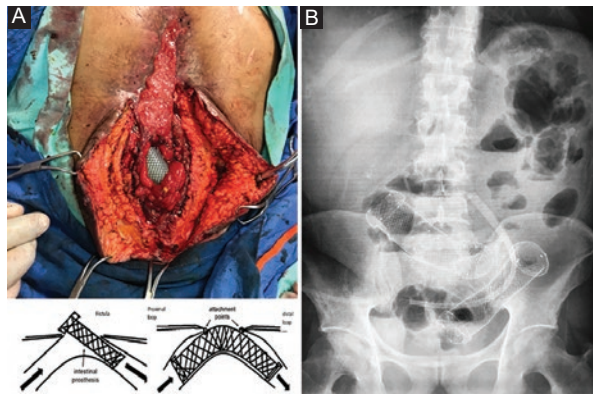


Figure 5. A: placement and adjustment of the intestinal endoprosthesis. B: control radiograph after stent placement at the fistula and sigmoid site.

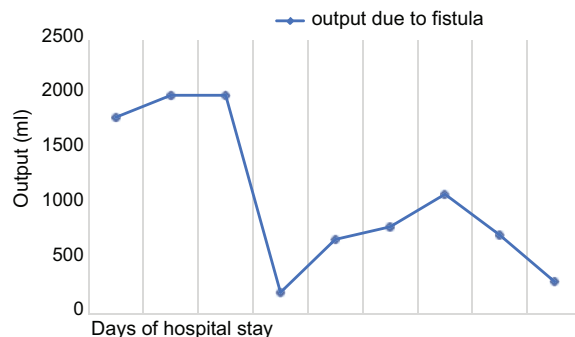


Figure 6. Output due to the fistula. A: stent placement; B: initiation of enteral diet; C: control of the fistula and decrease in output; D: hospital discharge.

closure. The intervention was performed on May 16, placing the stent through the midline invaginating the two segments of the stent and fixing it with non-absorbable sutures. By means of transoperative colonoscopy, a second stent was placed in the sigmoid to reduce intraluminal pressure and prevent leakage^{9,10} (Fig. 5). After placing the stents, fistula output decreased from 1500 to 200 ml over a period of 5 days. Enteral feeding was started, coinciding with an increase in output, which stabilized to 300 ml. The patient continued with total parenteral nutrition at the rate of 30 kcal/kg per day (Fig. 6). On the ninth postoperative day, discharge was decided without evidence of sepsis or fluid-electrolyte imbalance and with control of the fistula.

Results

Outpatient follow-up with the multidisciplinary team was performed on a monthly basis, evaluating the nutritional status and the surgical wound, which was



Figure 7. Fistula in the process of closure by second intention. The stent is observed in the middle third part.

90% closed at 6 months of follow-up, with no need for total parenteral nutrition. Only multivitamin supplementation and oxalate-free diet was needed, and the output through the wound was 50-150 ml (Fig. 7). The patient was partially reincorporated to daily activities and was self-sufficient.

The use of the endoprosthesis allowed early initiation of enteral feeding, improving quality of life and decreasing complications related to total parenteral nutrition (liver damage, steatosis, cholestatic syndrome, infections). Final adaptation of the colon was reached after 2 years. The patient did not present abdominal discomfort at the site of the stent.

Discussion

The use of intestinal endoprosthesis was tested in stoma-related colocutaneous fistulas by Nikfarjam et al.⁹ in two patients, limiting fecal contamination of the wound and fistula closure. Puig et al.¹⁵, from Mayo Clinic, used stents for the management of fistulas and stenosis in bariatric surgery anastomoses, which allowed sepsis remission, and improving nutritional status before definitive surgical correction.

Table 1. Indications and benefits of endoprosthesis in enterocutaneous fistulas

Indications	Benefits
Colocutaneous fistulas related to stomas	Wound isolation, promotes granulation and closure by secondary intention
Control of fecal matter (decrease of bacterial load), decrease of infections	Early initiation of enteral feeding, decreases bacterial translocation, improves enterocyte health
Hostile or frozen abdomen, or inability to mobilize bowels	Simple, reproducible, and well-tolerated technique (trained endoscopist and multidisciplinary team)
Need for oral supplementation	Ability to reposition in case of placement failure or migration
Restoration of intestinal transit	

Table 2. Risks, complications, and considerations of the use of enterocutaneous stenting for fistula management

Risks and complications	Considerations
Fibrosis of the intestinal segment in contact with the stent	Requires fixation to subcutaneous tissue and skin
Need for resection of fibrosed bowel	Need to decrease stool consistency with laxatives or fiber to reduce risk of migration and expulsion
May act as a foreign body and disrupt healing	Need for skin protection, to promote granulation and fistula closure
Need for monthly follow up with colonoscopy to detect early complications	Once the defect is closed, the stent should be removed. The intestinal segment can be resected or the fixation can be removed, and observation should be conducted until expulsion
	At least 2 months of observation is recommended before attempting removal

In 2016, Melich et al.¹⁰ reported endoscopic control of enterocutaneous fistulas by intussusception of two stents through the same fistula, allowing its closure with acceptable results. Xu et al.¹⁶ reported a case of enteroatmospheric fistula managed with a 3D printed stent, obtaining a drastic reduction in fistula output and rapid recovery.

The use of intestinal stents for the restitution of intestinal transit in selected patients with enterocutaneous fistula is a rescue procedure that can be offered after a thorough study by a multidisciplinary team, and is effective for the rapid restitution of intestinal transit, in the

context of hostile abdomen, without the possibility of mobilization of intestinal segments, elongation surgeries or intestinal resection, being necessary in patients in whom the remnant of functional intestine must be maximized.

Stent placement allows initiation of the enteral route, improves the general health of the patient, and reduces the need for parenteral nutrition and its complications¹⁷.

Rebibo et al.¹⁸ reported the use of stent grafting as a treatment for enteroatmospheric fistula associated with ileostomy, using a combined endoscopic and open surgical technique, allowing closure of the fistula. However, more case series and a larger number of patients are needed to evaluate the risk-benefit ratio of this treatment.

The indications and benefits of endoprosthesis are summarized in Table 1. The risks, complications, and considerations are summarized in Table 2^{8,9,15,16}.

Conclusions

The use of endoprosthesis to control the output of enteroatmospheric fistulas is controversial; yet, it can be considered as a rescue measure in selected patients, especially in those with a high potential for death due to the pathophysiology of the fistula. This makes intestinal endoprosthesis an acceptable measure for patients with this pathology. More case series treated in this manner, and with a formal protocol capable of reproducing the technique and assessing the risk-benefit, are needed.

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Conflicts of interest

There are no conflicts of interest for this article.

Ethical disclosures

Protection of people and animals. The authors declare that no experiments have been made on human beings or animals for this research.

Data confidentiality. The authors declare that they have followed the protocols of their work center regarding the publication of patient data.

Right to privacy and informed consent. The authors have received an informed consent from the patients and/or subjects referred to in this article. This document is in possession of the corresponding author.

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