Dynamic Fascial Closure and Botulinum Toxin: A Novel Alternative for the Definitive Closure of the Open and Contained Abdomen

Dr. Pablo Cingolani

RESUME

A case is presented in which a 54-year-old patient who, while being hospitalized for COVID19 pneumonia, suffered a septic shock due to acute Hinchey IV diverticulitis, for which Hartmann surgery was performed. He evolved with colonic ischemia, thus a total colectomy and open abdomen (OA) were performed.

The OA was handled with a vacuum system (VS) for 7 weeks, resulting in a type IIIa OA (Bjork) with a 26cm gap. Once the patient's clinical conditions were given, we decided to initiate a dynamic closure (DC) with a polypropylene mesh mediated fascial traction system associated with injection of botulinum toxin (BT).

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This strategy allowed a primary fascial closure (PFC) of the abdominal wall five weeks after starting the treatment, thus avoiding the morbidity of a second intention closure.

Keywords: COVID19, open abdomen, dynamic closure, botulinum toxin, primary fascial closure.

I. INTRODUCTION

OA is a therapeutic strategy that many surgeons are forced to come back to in the management of abdominal sepsis, damage control and abdominal compartment syndrome (ACS)[1], using a temporary abdominal closure (TAC) until the necessary conditions are achieved to perform a definitive closure of it.

When an early closure is not possible, the possibility of performing a PFC decreases abruptly, the hospitalization period is prolonged, and the incidence of complications associated with this method increases. [2]

With the goal of visceral protection and to facilitate posterior closure, while allowing easy access to the abdominal cavity, various static and dynamic TAC techniques have been described. A TAC technique should ideally provide visceral coverage while maintaining a physiological environment, prevent evisceration and adhesions between the viscera and the abdominal wall, decrease the retraction of the abdominal rectums, actively remove the excess of fluids along with bacteria and debris, be easy to use and as a consequence of all these mechanisms, preserve the integrity of the viscera and facilitate the definitive closure of the abdomen. [3]

Older techniques such as the Bogota bag not only do not allow adequate control of fluids but have shown not to facilitate the closure of the abdominal wall, resulting in long periods of hospitalization, with the dreaded risk of entero-atmospheric fistulas and the inevitable consequence of giant eventrations with their concomitant morbidity. With the advent of negative pressure therapy, these techniques began to evolve. However, the PFC of the open abdomen, mainly in prolonged therapy with a vacuum system, was not satisfactory. [4]

In 2007 Petterson et al describe the DC technique of the abdominal wall-Vacuum assisted wound closure with mesh mediated fascial traction-using progressive fascial traction with polypropylene mesh and VS, as a therapy for long-standing OA, facilitating PFC and reducing the complications associated with TAC of the OA. [5,6]

Since then, this technique has been used in several centers, and its experience and its long-term results are still under study. [6,7,8]

We present a case which we use this type of DC associated with the injection of BT in the lateral muscles of the abdomen, already used by Ibarra-Hurtado et al. in the preoperative management of giant eventroplasties, favoring the medialization of the rectus muscles and the compliance of the abdominal wall. [9]

A PFC of an initial defect of 16 cm was achieved in a type III OA (Bjork), without complications, with a follow-up of 6 months.

II. CLINICAL CASE

A 54-year-old patient who was hospitalized for bilateral pneumonia due to COVID-19, presented an acute perforative abdomen with a diverticular focus with fecal peritonitis and a requirement for Hartmann's surgery, with OA and with Bogota bag. Subsequently, a total colectomy with terminal ileostomy was performed due to colonic ischemia.

She was admitted to the Intensive Care Unit, treating sepsis at the respiratory, abdominal, urinary and biliary areas. Multiple cavity washes (12) and a percutaneous cholecystostomy were required.

She remained with a vacuum aspiration system (VAS) as TAC and weekly replacements were performed for 7 weeks, resulting in an OA type IIIa (Bjork).

A decision is made after 70 days, with the patient presenting favorable clinical conditions, dynamic closure with fascial traction using polypropylene mesh and VS.

She required a total of 6 scheduled admissions to the operating room for replacement of the VS system associated with section and gradual approximation of the mesh traction system [Figure 1]. Each procedure lasted approximately 20 minutes. All were performed in the operating room, under general anesthesia. On the third admission, 30 days prior to definitive closure, ultrasound-guided botulinum toxin infiltration was performed in the plane between the transverse and oblique minor muscle. A total of 100 IU of toxin were infiltrated, distributed in 3 equidistant points on each side.

An average of 2.6 cm was advanced in each procedure, starting with a gap of 16 cm. [Figure 2]

Definitive closure was achieved 6 weeks after starting therapy, performing a simple closure of the aponeurotic plane with PDS 0 in 6 tension-free sections. The patient remained admitted to the general hospital ward and was discharged from the institution 48 hours after the definitive closure, without complications associated with a 6-month postoperative follow-up.

II. DISCUSSION

OA is an entity with high morbidity and mortality, not only due to the critical condition of the patient, but also due to the complications of the method. Enteric fistula and complex eventration with loss of residence are the ones with the highest morbidity. Early PFC is the most optimal strategy to avoid them. [10]

Negative pressure associated with TAC should be the selected therapy since it has shown superior results when comparing cases in which this technique is not used or is not available. [2]

In patients who do not perform an early definitive closure (7-10 days) and who present a type I and II OA (Bjork), DC is recommended as it has shown benefits compared to the static one. [11]

A prolonged OA presents a great retraction of the lateral muscles, type III has firm adhesions (frozen abdomen) and type IV enteric fistula. [12] This condition causes them to be deferred for a definitive closure after 6 to 12 months, with an extensive period of great morbidity and condemned to complex herniations.

BT has been used both in delayed closure for the treatment of large hernias as a result of OA, as well as in its acute management to facilitate definitive closure. [9,13.]

In our case, the use of DC (fascial traction through mesh and VS) combined with the application of

BT in a period of 5 weeks, allowed the PFC of a type III OA (Bjork).

The DC must include VS with an extensive separation sheet in the space between the viscera and the parietal peritoneum, avoiding adherence between these two planes to allow the muscle wall to slide over the viscera.

On the other hand, TB acts on the great muscular retraction of the lateral muscles generating a flaccid paralysis that allows us to elongate them, facilitating the medialization of the rectums with the traction of the DC and in this way it achieves the PFC without tension.

IV. CONCLUSION

We consider that the association of DC and BT would allow doctors to achieve definitive abdominal closure in patients with great muscle retraction OA, type III (Bjork) who are currently deferred for late closures. Experience with a greater number of cases is required to be able to produce long-term results with the use of this technique.

Authors' Note:

- We declare that we have no conflicts of interest. The clinical case has not been previously published, neither has it been in the process of evaluation or publication in another journal. I authorize the publication of the document by the Argentine magazine of surgery.

Figure 1: Dynamic closure technique, with section and gradual approximation of the traction system with polypropylene mesh associated with VS therapy

Figure 2: Evolution of therapy. An initial 16cm gap is observed on computed tomography of the abdomen, with wide muscle retraction. On the right, there is evidence of broad muscle relaxation (red box) after infiltration with BT and approaching of the rectus muscles to the midline