Case Report
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Use of botulinum toxin in surgical preparation for complex incisional hernias

Abstract

Abdominal wall defects with incisional hernias after surgery represent a great challenge for surgeons due to their technical complexity for treatment, largely attributed to the retraction of the lateral muscles of the abdominal wall. Reconstruction of the abdominal wall is understood to refunctionalize it with the approximation of the rectus abdominis muscles through its midline. The use of botulinum toxin serotype A (TBA) has shown that its use produces a temporary flaccid paralysis in the abdominal muscles, favoring midline closure, caused by muscle flaccidity and greater complacency caused by the toxin.

Abdominal hernias result in increased morbidity due to lung restriction, aerophagia, abdominal pain, constipation, and urinary alterations), with a consequent decrease in quality of life.

Keywords: incisional hernia, botulinum toxins, type a; abdominal wall

Volume 13 Issue 3 - 2022

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Received: May 17, 2022 | **Published:** June 08, 2022

Introduction

Incisional hernia is a common type of hernia of the abdominal wall at the site of an anterior surgical incision, with a prevalence of more than 30% in high-risk groups, and is most often located in the midline of the abdomen, resulting from a failure of abdominal wall closure.[1–3]

This complication has been shown to generate a considerable cost to society, as hernia-related expenses in the United States increased by 52% from 2007 to 2011, estimated to be approximately $7.3 billion annually.[4–6] As a result of the challenges of abdominal wall surgeries, studies have demonstrated the use of botulinum toxin A (TBA) injection to aid in the operative preparation of incisional hernias.[7,8]

TBA is a neurotoxin that acts selectively on the presynaptic cholinergic nerve terminals, blocking the release of acetylcholine. This action will promote relaxation of the lateral muscles of the abdominal wall (internal oblique, external oblique, and transverse abdominal), facilitating the closure of the aponeurosis, as well as decreasing postoperative pain.[8–10] The goal of using TBA is to perform an elective incisional hernia preparation, to prevent early recurrence and decrease the risk of abdominal compartment syndrome and some complications such as incarceration, bowel obstruction, and incarceration.

Experience report

The abdominal wall plasty is understood to refunctionalize the anatomy and function of the abdominal wall with the approximation of the rectus abdominis muscles through its midline. The use of TBA has demonstrated that its use produces a temporary flaccid paralysis in the abdominal muscles, favoring the closure of the midline, caused by muscular flaccidity and greater complacency provoked by the toxin.[2,4]

The objective of the application of TBA in the preoperative in patients with incisional hernias with defects larger than 10 cm, as an alternative to the treatment with pneumoperitoneum, in face of its high rate of complications such as infection, hospital stay, sometimes longer than 15 days, and complexity (higher cost than the use of botulinum toxin).

Application protocol

1. Patients with giant incisional hernia with loss of domicile (>10 cm) and indication for surgical treatment without clinical contraindication.
2. Evaluation with computed tomography (CT) of abdomen and pelvis with measurement of abdominal volumetry
3. Botulinum toxin A (TBA) injection
   a. Interventional radiology (puncture guided ultrasonography)
   b. 5 puncture points according to Figure 1
   c. 1 ampoule (100UI) diluted in 2 mL of sterile solution (total of 10UI in each point)
   d. Reevaluation by CT of abdomen and pelvis in 21 days for new abdominal volumetry

Discussion and conclusion

Incisional hernias occur in 15-28% of all patients undergoing abdominal surgery, and their repair is a complex procedure with high failure rates. It is estimated that within three years the hernia recurrence rate ranges from 15-21% for open repair and 7-15% for laparoscopic repair. This vicious cycle of recurrence contributes to worse surgical outcomes for patients in addition to greater expense to the healthcare system. [11–13]

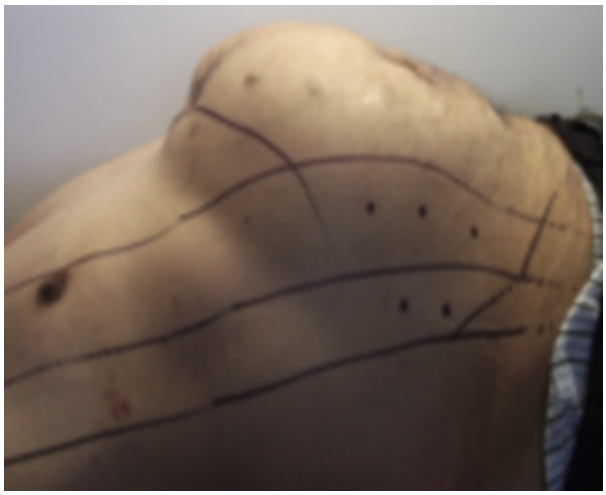

Figure 1 Points of preoperative botulinum toxin infiltration, showing 2 points in the medial axillary line and 3 points in the external oblique muscle guided by ultrasound.

TBA is a neurotoxin isolated and purified from Clostridium bolutinum type A bacteria and acts at the neuromuscular junction by inhibiting the release of acetylcholine and causing flaccid paralysis.[10, 14] The effects of botulinum toxin begin to appear within two to three days, with complete effect in two weeks and decline after 3 months. Application of this toxin to the lateral musculature (internal oblique, external oblique, and transverse abdominis) can paralyze and subsequently lengthen the muscle complex. Thus facilitating the medialization of the rectus muscles and the closure of the abdominal wall.[15,16]

Furthermore, several researches have proven that the use of TBA in the preoperative management of hernias did not bring significant complications during and after the surgical procedure. A clinical trial, published in 2020, compared 80 consecutive patients with large midline incisional hernias. The patients were divided into 2 groups, of which 40 had preoperative TBA administration and open Rives repair, and the rest underwent only open component separation during the observation period. The result of the prospective, comparative study was that complete fascial closure was possible in all subjects in the BTA group and that there were no complications during the administration of the neurotoxin in the preoperative period.[17]

A systematic review published in 2017 demonstrated that in addition to the importance of BTA in hernia repair favoring fascial closure, long-term analgesic effects were also obtained through ultrasound injection of Botox and could relieve pain for up to 3 months. Moreover, use of Botox preoperatively reduced the width of the ventral hernia and lengthening of the abdominal muscles bilaterally, thus favoring the approximation of the borders without interrupting healing.[18]

Protocols for the use of TBA have been described in the literature, in which the injection of the toxin was always guided by an imaging exam (tomography, electromyography and ultrasonography), with ultrasonography being the most used. The injection should be applied at least 2 weeks before reconstruction of the abdominal wall, with maximum effect between 2 and 4 weeks. The most commonly used botulinum toxin dosages were 200-300 units of TBA-Botox® or 500 units of TBA-Dysport® in a 2:1 saline dilution, with Dysport® being less potent. In all studies, both the external and internal oblique muscles were injected, however the vast majority of studies BTX was injected into all 3 muscles (internal oblique, external oblique and transverse abdominis).[19]

Also, Ibarra-Hurtado et al. published two studies, which included all 29 patients with midline defects. They received a total dose of 500 units of TBA 4 weeks before the hernia repair. The surgical procedure was performed with either retro muscular mesh placement or through simple suture closure without mesh. Successful primary fascial closure was achieved in 100% of patients, however, 15 patients (53%-23 and 50%-24) still required additional component separation techniques for abdominal closure.[19,20]

In our surgical service we currently have 4 patients who underwent TBA guided by ultrasonography respecting the indications in the literature with satisfactory results from the surgical point of view, without any clinical or surgical complication related to the technique described. Despite being cases of complex hernias, the use of TBA showed to be efficient in the surgical preparation of these patients, leading the cases to an easier aponeurotic and fascial closure, without presenting recurrence of the cases as described in Table 1.

Table 1 Analysis and follow-up of patients submitted to the use of TBA in the surgical preparation of complex incisional hernia repair

Pacient / Years	BMI (Kg/m²)	Size of the Defect Diameter on the Largest Shaft (mm)	Complications	Follow-up (months)
A.D.F / 57	29,2	110	No	4
B.D. / 44	26,4	125	No	8
N.M.D. / 61	24,9	140	No	11
Z.M.L/ 59	31,1	120	No	12

The use of TBA has been widely used in the treatment of complex hernias of the abdominal wall, being increasingly indicated against other more expensive and less safe options. More studies and systemic reviews are still needed to evaluate the benefit of its long-term use and consolidate the indication of TBA as a routine in the surgical preparation of these patients with large abdominal wall defects.

Acknowledgments

For all researches of this study.

Conflicts of interest

The authors declare no conflicts of interest.

Funding

None.

Research ethics committee approval

We declare that the patient approved thestudy by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

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Citation: Gentile JKA, Lima ASB, Costa CM, et al. Use of botulinum toxin in surgical preparation for complex incisional hernias. *Gastroenterol Hepatol Open Access.* 2022;13(3):94–96. DOI: 10.15406/ghoa.2022.13.00503