Preoperative treatment with botulinum toxin A: a tool for giant groin hernia repair? Case report

Rocio Avellana, Maria Jesus Peña, Patricia Saez, Juan Cabeza, Antonio Torres
Hospital Clínico San Carlos, Instituto de Investigación Sanitaria del Hospital Clínico San Carlos (IdISSC), Madrid, Spain

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ABSTRACT: Introduction: Giant groin hernia is an unusual disease nowadays and its management can be a challenge for surgeons. The application of botulinum toxin A as a preoperative therapy could decrease the thickness of the lateral wall muscles, increase their length and increase the volume of the abdominal cavity facilitating the surgical repair. Morbidity and mortality due to high intra-abdominal pressure would decrease, allowing a minimal tension closure after reduction of the herniated viscera.

Case report: We present the repair of two cases of massive inguinal hernia with loss of domain using preoperative abdominal wall injection of botulinum toxin.

KEYWORDS: botulinum toxin A, giant groin hernia, loss of domain

ABBREVIATIONS
BTA – botulinum toxin A
CT – computed tomography

INTRODUCTION

Giant groin hernia is defined as a hernia that extends below the midpoint of the inner thigh when the patient is in standing position but also when the hernial sac contains more than 15–20% of the abdominal organs. It is an unusual disease nowadays and its management can be a challenge for surgeons [1].

Returning the hernia contents to the abdominal cavity requires a significant physiological adaptation. It entails an increase of intraabdominal and intrathoracic pressures which can lead to respiratory compromise and compartment syndrome associated with high morbidity and mortality [2].

The ideal management has not yet been standardized in these cases. Some techniques as pneumoperitoneum, abdominal wall component separation, rotation flap and chemical components relaxation with botulinum toxin A (BTA) have been described in order to increase the abdominal cavity volume preoperatively and consequently avoid the side effects produced by reducing the giant hernia contents [1]. As it is known, botulinum toxin injection into the abdominal wall musculature produces a flaccid paralysis, decreasing abdominal wall tension, intra-abdominal pressure and increasing the intra-abdominal volume [1, 3, 4].

We present the repair of two cases of massive inguinal hernia with loss of domain using preoperative abdominal wall injection of botulinum toxin A.

CASE REPORT

The first case is a 66-year-old male patient that presented at our medical outpatient office with a long-term asymptomatic bilateral inguinoscrotal hernia. The patient’s medical history included hypertension, dyslipidemia and type II diabetes. The CT scan revealed bilateral groin hernias containing small bowel, vessels and fat tissue without signs of complication (Fig. 1.–2a., b.).

The second case is a 75-year-old male patient that presented at our emergency department with pain in the left inguinoscrotal hernia. His medical history included benign prostatic hyperplasia and myocardial infarction. The CT scan was reported as an indirect inguinal left hernia of 17 x 15 cm containing the descending colon and ileum, free peritoneal fluid without complication signs.

In both cases, preoperative administration of botulinum toxin A (Botox, Allergan, Irvine, CA, USA) using ultrasound guidance was performed under local anesthesia and sedation at 9 points of the abdominal wall. The application points were scored and measured symmetrically equidistant between the costal margin and the iliac crest as described by Ibarra [1]; two points at the midline axillary line, three between the anterior axillary line and the middle clavicular line, two lateral to the supraumbilical midline and 2 at the infraumbilical lines. We diluted 100 U of toxin into 5-mL saline solution, using 400 U in total (1 mL per point). The patients were discharged the same day on an outpatient surgery basis, with no complications after BTA administration registered.

Four weeks after the infiltration, a CT scan was performed to analyze the decrease in the thickness (1 cm in the first case and 1.2 cm in the second one) and the increase in the length of the lateral wall muscles (0.6 cm), the transverse diameter (3.6 cm and 1.2 cm respectively) and an appropriate increase in the abdominal cavity volume (26% approximately). Surgery was scheduled 6 weeks after botulinum toxin administration (Fig. 1c., 2c.).

A Lichtenstein tension-free hernioplasty with a polypropylene mesh was performed in both cases, placing a drainage in the scrotal sac. No complications were recorded during the postoperative period. Drainages were removed on the third and fourth postoperative day without surgical site complications, and both patients were discharged on day five without developing any complications regarding hernia reduction, neither respiratory
cholinergic receptors blocking the release of acetylcholine and pain modulators from the pre-synaptic cholinergic nerve terminal, resulting in flaccid paralysis and pain modulation [4].

Adverse effects of BTA administration are minimal and uncommon especially when the dose does not exceed the recommended one. They can include nausea, pain, infection, inflammation, dry mouth, transient muscle paralysis, headache, urticaria, and bleeding. Contraindications of administration are: known allergy to the drug, pregnancy, lactation, neuromuscular disorders (such as amyotrophic lateral sclerosis, myasthenia gravis, Lambert-Eaton syndrome, muscular dystrophy and multiple sclerosis), and patients who are on calcium channel blockers treatment or with aminoglycoside, which may interfere with neuromuscular transmission [4]. Clinical effects can be observed after the first 10 days but the maximum effect develops in the third-fourth week, with a duration of the effect of 6–9 months [9].

Botulinum Toxin was described in 1817 by Kerner, who predicted that this substance would have many applications in medicine. In 1980 Scott reported the utilities of the toxin in the treatment of strabismus. However, it took 12 years until it was used in the field of aesthetics and its real diffusion began [4].

In an animal model, Cakmak et al. showed that toxin injection into the abdominal wall musculature decreased intra-abdominal pressure, increased intra-abdominal volume and decreased the motor unit potential of the abdominal muscles in rats [10]. The neurotoxin acts on botulinum toxin A and "tension-free" hernia repair.

Botulinum toxin is a natural potent neurotoxin produced during growth and autolysis of Clostridium botulinum, an anaerobic gram-positive bacterium. It has eight kinds of serologically distinct types of toxin named from A to G but type A and B are the only ones which are commercially available, with the first one being more effective and commonly used [4]. The neurotoxin acts on cholinergic receptors blocking the release of acetylcholine and pain modulators from the pre-synaptic cholinergic nerve terminal, resulting in flaccid paralysis and pain modulation [4].

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In order to avoid the development of an abdominal compartment syndrome, resulting from organ repositioning, different techniques have been suggested, such as progressive pneumoperitoneum, peritoneal flap and botulinum toxin A [1, 8] or combined use of progressive pneumoperitoneum and botulinum toxin A [7]. In the present cases, we combined preoperative injection of botulinum toxin A and "tension-free" hernia repair.

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**DISCUSSION**

Treatment of giant groin hernias represents a surgical challenge. Reduction of hernia contents back into the abdominal cavity can lead to an abrupt increase in intra-abdominal pressure, a reduction of venous return, and a decrease in excursion of the diaphragm [2]. Sudden reintroduction could increase intraabdominal and intrathoracic pressures precipitating severe cardiac, respiratory failure and compartment syndrome [5]. In this sense, returning these contents requires significant physiological adaptation (mainly respiratory) especially if the volume exceeds 15–20% of the abdominal compartment [6]. Therefore, adequate preparation before surgery is vital [7].

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**Fig. 1.** First case preoperative (a), TAC operative (b), postoperative (c).

**Fig. 2.** Second case preoperative (a), TAC operative (b), postoperative (c).
botulinum toxin A was initially described for the reconstruction of abdominal wall ventral hernias after open abdomen it is also useful in other fields of abdominal wall surgery.

As reported in these two cases, it could be a useful tool in patients with inguinoscrotal hernia with loss of domain. Ibarra was also the first author who described this treatment for loss of domain inguinoscrotal hernias and presented a protocol of administration in these cases – the one that we used [1]. Chemical components relaxation technique with botulinum toxin injection creates a flaccid paralysis, which facilitates visceral reintroduction during surgery, decreasing the respiratory compromise and compartment syndrome, allowing for a minimal-tension closure after reduction of the herniated viscera. An additional advantage might be its ability to modulate pain because it inhibits the release of substance P and calcitonin gene-related peptide, molecules that are involved in inflammation and pain sensation, decreasing narcotic and sedation requirements [12].

The application of botulinum toxin A as a preoperative therapy could decrease the thickness of the lateral wall muscles, increase their length and increase the volume of the abdominal cavity facilitating the surgical repair. Enlargement of the abdominal capacity can facilitate bowel reintegration as well as lung adaption to the postoperative situation in cases of a loss of domain [8]. Morbidity and mortality due to high intra-abdominal pressure would decrease. According to these factors, it may be considered as a useful minimally-invasive treatment option in these cases.

CONCLUSION

Preoperative application of botulinum toxin A in massive groin hernia cases is a useful tool in preventing complications derived from the reduction of hernia contents (compartment syndrome) and facilitates surgical treatment.

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Corresponding author: Rocio Avellana (ORCID: 0000-0003-1309-1506); MD General Surgery, Hospital Clínico San Carlos, Madrid, Spain; E-mail: rocoavellana@gmail.com

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