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Adjuvant botulinum toxin for endoscopic management (preaponeurotic endoscopic repair) of severe diastasis recti

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Abstract:

INTRODUCTION: Diastasis recti (DR) associated with midline hernias is common. Big size DR represents a clinical and cosmetic problem. Its repair is challenging, with intraoperative and postoperative risks. The adjuvant of botulinum toxin serotype A makes it possible to restoration of the linea alba by preaponeurotic endoscopic repair (REPA).

METHODS: This was a retrospective study with prospective database. Between February 2019 and July 2020, six women were operated, with a mean age of 39 years and a diagnosis of DR >80 mm, with a body mass index of 27. All patients were infiltrated with 50 UR of botulinum toxin serotype A on each side, 30 days before the surgery.

RESULTS: The intraoperative diagnosis of DR was 87.5 mm average, associated with midline hernias in 100%, with a mean transverse diameter of 24 mm (10–60 mm) Anatomical restoration of the linea alba was performed with a slow absorbable barbed suture. The wall was reinforced with 100% macroporous polypropylene mesh, with 83.3% atraumatic fixation and 16.6% absorbable traumatic fixation. The surgical time was 94 ± 15 min. Postoperative pain was 2/10 ± 1 according to the Visual Analog Scale, allowing a hospital stay of 18 ± 4 h. Return to work 18 ± 3 days. The mean follow-up was 9 (2–18) months by the clinical and ultrasound examination in 100%, without complications or recurrences.

CONCLUSIONS: The application of botulinum toxin serotype A associated with endoscopic repair (REPA) allowed solving the big size DR and midline hernias with suture of the rectus sheath with less tension, associated with a reinforcement prosthesis, allowing a reduced hospitalization with a low level of postoperative pain, avoiding muscle release incisions, which are irreversible and not exempt from morbidity, added to the proven benefits of endoscopic access.

Keywords:

Botulinum toxin, diastasis recti, preaponeurotic endoscopic repair, restoration linea alba

Introduction

Diastasis recti (DR) is a frequent entity, it is observed in both sexes, with a higher prevalence in women after pregnancy and the puerperium, being permanent between 15 and 32%.[1,2] According to its size, it can be voluminous (W3),[3] especially in multiparous women, referred in 6%[2] and associated with midline hernias in 100% (umbilical, epigastric, and/or incisional).[2,4] This determines a clinical and cosmetic problem, describing manifestations such as low back pain (68%), digestive disorders (constipation), pelvic floor muscle disorders associated with urogynecological pathology (60%), negatively affecting the quality of life.[4-6]

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The repair of DR W3 associated with midline hernias is a challenging situation for the surgeon because in these cases the linea alba is very thin and large and can coexist with multiple hernial defects, predisposing to the opening of the peritoneum and/or aponeurosis and entry into the abdominal cavity, linked to the difficulty in restoring the midline at the time of suturing, which could cause a tear of the rectus sheath and a tension closure with a potential risk of developing a contained acute eventration, exposure of the mesh to the abdominal viscera a postoperative abdominal compartment syndrome.[4]

To achieve medialization of the rectus muscles with less tension during the suture in the preaponeurotic endoscopic repair (REPA), we performed a muscular release of the external oblique,[2,5-7] which is an irreversible condition with risk of bulging or incisional hernia.

Objective

Our objective is to evaluate the feasibility of re-approximation of the rectus muscles using endoscopic suture (REPA) in DR W3 after infiltration with botulinum toxin subtype A (BTX-A).

Methods

Between February 2019 and July 2020, patients with DR > 8 cm in transverse diameter associated with midline hernias were prospectively selected for preoperative infiltration of BTX-A, who later underwent endoscopic surgery (REPA). Six female patients entered the study, with a mean age of 39.5 years. All the patients had consulted for abdominal pain and epigastric and periumbilical bulging associated with midline hernial defects [Figure 1].

The average body mass index (BMI) was 27.6 (24-31).

The inclusion criteria were as follows:

1. Age (>18 years)
2. DR >8 cm apart, confirmed on physical examination and imaging methods
3. Presence of primary hernias or medial hernias <6 cm
4. Patients in American Society of Anesthesiologists (ASA) I-II
5. Patients without cardiopulmonary diseases or relevant chronic treatments
6. No history of exposure to botulinum toxin type A within 6 months prior to its infiltration.

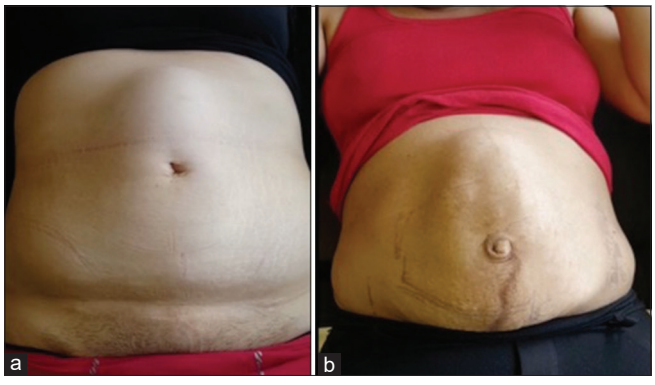

Figure 1: (a and b) Clinical presentation of diastasis recti W3

The exclusion criteria were as follows: patients with urgent presentation hernias, patients in ASA Type III-IV, patients who did not sign the informed consent or did not accept the application of BTX-A or the intervention, and patients with chronic diseases and/or difficult follow-up.

All patients were informed of their process, understood it and signed the informed consent.

Botulinum toxin type-A infiltration technique

BTX-A infiltration was performed in a scheduled and outpatient session. It was carried out in a triangular area delimited by two parallel lines that pass through the anterior and posterior axillary lines, an upper one below the costal margin and a lower one above the anterior superior iliac spine. This area presents the highest density of neuromuscular junctions of the broad muscles of the abdomen, at this level and in accordance with the mid-axillary line; one point was marked on each side. The 100 UR of BTX-A was diluted in 4 cc of physiological solution and 2 cc, 50 UR was applied to each side (100 UR in total) guided by ultrasound, 30 days before surgery [Figure 2a-c].

Follow-up period

The patients received a 15-day follow-up after the application of BTX-A and underwent surgery 30 days after it. In the postoperative period, they were discharged and controlled in a personalized consultation for the evaluation of the drains and the wounds 1 week, 6 months, and 1 year after the operation; in order to detect and document the postoperative complications. The mean follow-up was 9 months (2 to 18 months) by the clinical and ultrasound examination in 100% of the patients. In 50% of the cases (3 patients), imaging studies were not performed because they did not reach the 12-month follow-up.

Results

The overall mean age of the group was 39.5 ± 4.6 years. The diagnosis of DR was clinical, and the complementary examinations were routine, to obtain ultrasound images (83.3% and computed tomography 16.7%) to document the parietal defect, not due to diagnostic necessity, since its diagnosis is eminently clinical [Table 1].

The patients reported stress urinary incontinence (50%), low back pain (83.3%), and constipation (33.3%). The

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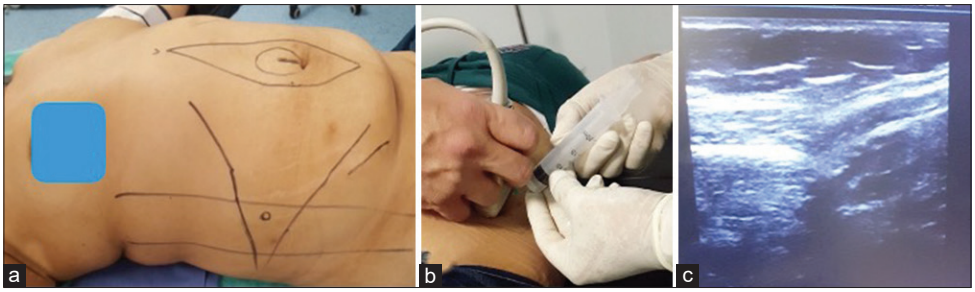

Figure 2: (a) Marking of the TBX-A application site and defects. (b) Infiltration under ultrasound guidance. (c) Identification of the needle and TBX-A solution in the muscle plane

Table 1: Complementary Diagnostic Methods

Complementary Diagnostic Methods	
Soft tissue ultrasound	83.3%
Computed axial tomography	16.7%

mean number of pregnancies was 2.8 (1–5). 50% of the patients performed daily work of moderate effort. In 83.3% of the cases, they had previous abdominal surgeries; the most frequent was cesarean section (66%), followed by appendectomies, umbilical hernioplasty, and laparoscopic cholecystectomy. The anesthetic risk was evaluated according to the scale of the ASA [Table 2].

The cross-sectional diameter of the DR is quantified intraoperatively, observing in all cases a horizontal inter-rectum distance greater than 80 mm [Graphic 1].

An association of DR to midline hernia defects was evidenced in 100% of the patients, with a mean transverse diameter of 24 mm (10–60 mm) [Table 3].

Continuous suture of the rectus muscle sheath aponeurosis was performed, from the xiphoid appendix to the pubis, on several occasions, it was necessary to remove the optic trocar to complete the suprapubic level [Figure 3]. Infiltration with BTX-A allowed the re-approximation of the rectus muscles in all patients in the series. Without reversible flaccid paralysis of the muscles after its application, the restoration of the midline would not have been possible without practicing relaxation incisions.

A number 0 barbed suture was used in 100% polydioxanone (66.5%) and composed of a copolymer of glycolic acid and trimethylene carbonate (33.5%) [Figure 4]. We consider that the restoration of the midline should be in its entire length from the xiphoid appendix to the pubis, and not sectorized, allowing a complete re-functionality of the abdominal wall.

Once the midline had been restored, the abdominal wall was reinforced, especially at the suture level, using lightweight (66.6%) and intermediate-density (33.3%) polypropylene (PP) prostheses. The average size of

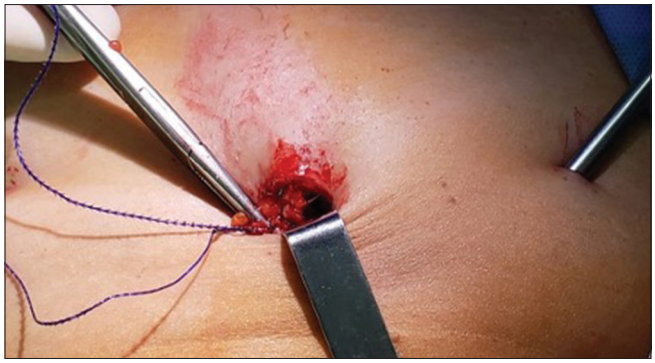

Figure 3: Completion of the extracorporeal suture

the mesh was 24 cm × 20 cm and 22 cm × 15 cm in the bilaminar self-fixings (composed of monofilament PP, covered by an absorbable layer of polyethylene glycol and polyvinylpyrrolidone) [Figure 5a-c].

The fixation of the prosthesis was noninvasive in 83.3% (cyanoacrylates 50% and self-fixing mesh 33.3%) and invasive in 16.6% with absorbable straps [Graphic 2].

The mean surgical time was 94 ± 15 min. Drains, which were removed after an average of 9.6 days (5-14), were left in 100% of cases [Figure 6a and b]. The tube will be removed when drainage is below 30 ml/day for 2 days in a row.

Intra- and postoperative complications were not observed. The level of postoperative pain evidenced by the Visual Analog Scale (VAS) was 2/10 ± 1, allowing a mean hospital stay of 18 ± 4 h. Average return to work: 18 ± 3 days. The mean follow-up was 9 months (2-18) by the clinical and ultrasound examination in 100%, without complications or recurrence. A recurrence is considered when the distance between the inner edges of both recti is greater than 15 mm at the supraumbilical level or 25 mm at the infraumbilical level.

The satisfaction of the acting surgeons was 100%, since the application of the botulinum toxin allowed the midline approaching with less tension, facilitating the repair of the parietal defect.

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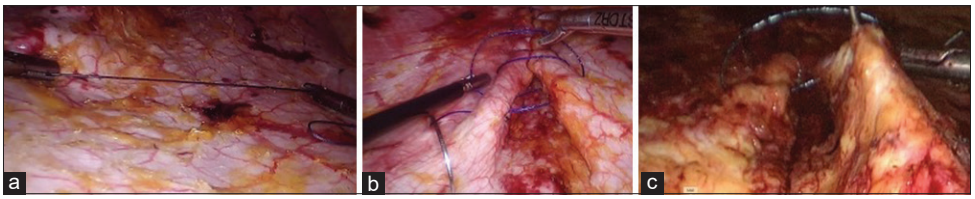

Figure 4: (a) Diastasis recti size measurement. (b) Polydioxanone barbed suture and (c) Glycolic acid and trimethylene carbonate copolymer composite suture

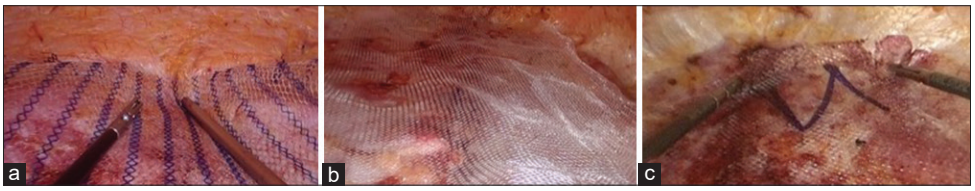

Figure 5: (a and b) Intermediate density PP mesh and (c) Self-fixing mesh

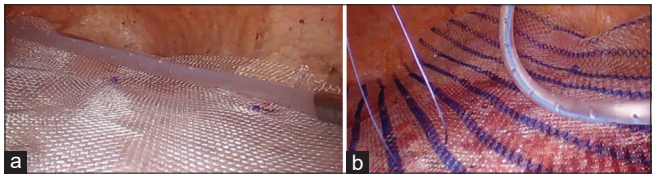

Figure 6: (a and b) Systematic use of suction drains

Discussion

There is sufficient evidence in the literature regarding the association of DR with midline hernial defects, but we did not find any publications related to the use of BTX-A for the management of large DR (W3), especially using repair through minimum access (REPA).

Major hernial defects are related to a poor condition of the abdominal wall, it is anatomically and morphologically damaged or altered, with local and generalized progressive involvement. This can have considerable physiological and esthetic consequences for the quality of life of patients. When performing a dynamic repair of the abdominal wall, it is assumed that the defect will be closed, since it will be re-functionalized with the "medialization" of the rectus abdominis muscles.

For this, the aponeurotic coping of both hernial ends is of vital importance, since the restructured wall functions as the primary support and prevents excessive tension on the mesh,[8] allowing a greater mesh-tissue interface, facilitating its integration into the healing process, thus reducing the possibility of recurrence.

The use of BTX-A has been shown to produce a temporary flaccid paralysis (between 6 and 8 months) in the abdominal muscles, which favors the aponeurotic closure of the midline without less tension in most large defects,[9] allowing in selected cases, to add component separation techniques if necessary.[9,10]

Table 2: Assessment of anesthetic risk according to the ASA scale

Anesthetic Risk of the American Society of Anesthesiology	
ASA I	33.3%
ASA II	66.6%

Table 3: Midline hernial defects associated with DR

DR associated with Midline hernias	
Umbilical Hernia	50.0%
Umbilical + Epigastric Hernia	16.6%
Incisional Hernia Umbilical	33.3%

In our experience, we observed that patients with large DR (W3) associated with hernias of the midline, young, healthy, multiparous women with an average BMI of 27, who refer manifestation of low back pain in 83.3% and effort urinary incontinence in 50% of the cases.

Eighty-three point three of the cases presented previous abdominal surgeries (66% cesarean section); however, this previous event neither influenced nor affected the execution of the procedure.

After infiltration with BTX-A in both flanks as the only application, no unwanted effects or immediate or distant complications were observed. A flaccid paralysis of the broad muscles of the abdomen was evidenced both at rest and in Valsalva, effects similar to those observed by Ibarra-Hurtado *et al*.,[7-11] allowing medialization of the rectus muscles without less tension, facilitating endoscopic suturing (REPA) in 100% of the cases, avoiding the performance of a muscular discharge of the external oblique,[2,5,6,12] a definitive condition with a potential risk of bulging or incisional hernia in such area during the postoperative period. It also allows, in DR greater than 10 cm to minimize the risk of postoperative abdominal compartment syndrome (ACS)[4] and a better management of analgesia in the immediate postoperative period by reducing the level of pain,[11] a situation also

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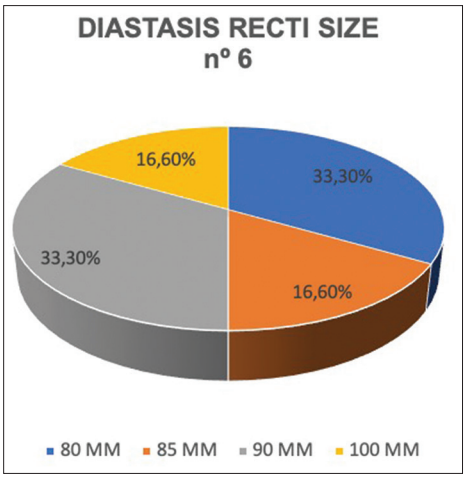
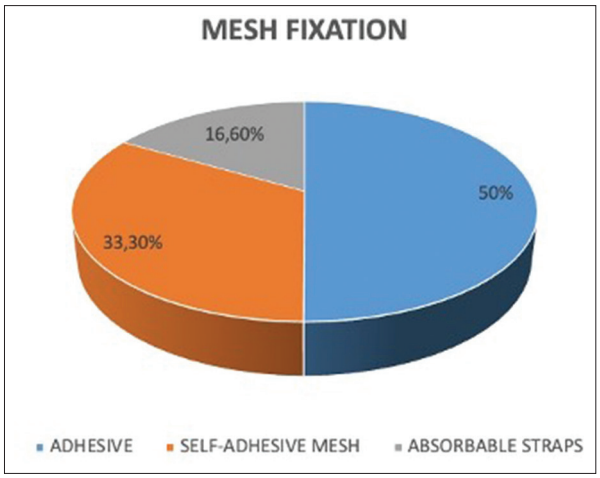


Graphic 1: Cross-sectional size of the DR measured intraoperatively



Graphic 2: Different method of fixing the mesh

observed in our patients, with a level mean postoperative pain of 2/10 ± 1 according to VAS.

The cross-sectional diameter of the DR was measured intraoperatively, observing a mean horizontal interrectum distance of 87.5 mm (80-100 mm) with an association with midline hernial defects in 100% of the patients with an average diameter of 24 mm (10–60 mm). In hernial defects >25 mm, the hernial ring was closed first, and then, the midline repair was performed.

According to the Classification of Rectus Diastasis - A Proposal by the German Hernia Society (DHG) and the International Endohernia Society[3] defines an interrectus separation greater than 5 cm as severe DR, without discriminating DR with a transverse diameter greater than 8 cm, in which the closure of the midline without tension is practically impossible, requiring in these cases the support of neoadjuvant techniques such as BTX-A or the release of the external oblique muscle (unilateral or bilateral) to be able to carry out a suture with less tension. We suggest in this group of the classification, making a subdivision of the DR of 5 to 8 cm and of more than 8 cm, since the surgical procedure used would not be the same.

The approximation of the medial edges of the rectus muscle sheath was performed by continuous suture, using a number 0 barbed suture, this allowed to support the musculofascial tension at the moment of traction and to perform a good coping and restoration of the entire line alba from xiphoid to pubis. It is a basic principle to reestablish the biomechanics of the abdominal wall[7,11] in its entirety and not sectorized.

The abdominal wall is reinforced, especially at the level of the plication, using a PP prosthesis, providing greater safety to the anatomical restoration of the linea alba.

The overlap of the mesh with respect to the size of the interrectus separation was between 4 to 5 cm with respect to the external limit of the DR before suturing. Correct manipulation of the prosthesis is important, avoiding its contact with the skin and the use of preincisional antibiotic prophylaxis as well as during the first 24 h after surgery, could reduce the risk of postoperative infection.[2,5] The prosthesis was fixed in three different ways. The use of different fixation materials had no influence on postoperative pain, complications such as seroma, infection, or recurrence of the diastasis of the rectus muscles.

The mean surgical time was 94 ± 15 min. The flaccidity of the abdominal wall induced by the application of BTX-A, allowed the approach of midline without tension or difficulty in DR of these dimensions, facilitating an anatomic-functional parietal repair, with good cosmetic effect and postoperative comfort of the patients, granting satisfaction of the acting surgeons.

Drains, which were removed after an average of 9.6 days (5-14), were left in 100% of cases. The tube will be removed when drainage is below 30 ml/day for 2 days in a row.

The hospital stay was reduced with an early return to work. The mean follow-up of the patients was 9 months (2-18) by the clinical and ultrasound examination in 100%, with no evidence of complications or recurrences.

Starting with physiotherapy and lymphatic drainage maneuvers is advised as early as possible in the preoperative period and they begin 7 days after surgery, if possible, to try to achieve an improvement in daily physical activity, physical exercises, a rapid recovery of skin sensitivity, with less sensation of swelling and better well-being in the postoperative period.[2,5]

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The use of BTX-A and endoscopic suture (REPA) is an excellent option for the management of DR W3 associated with midline hernia. The main objective of REPA is to prioritize the anatomical and functional restoration of the midline and a repair of hernial defects, over the aesthetic aspect. However, good cosmetic results are obtained, increasing the patients' self-esteem and improving their quality of life with low morbidity.

In patients with DR and a dermo-fat abdominal apron after 1 year postpartum, we indicated an abdominoplasty due to the obvious aesthetic benefit,[5] but it should be clarified that there is a selected group of patients who have an indication for abdominoplasty, who reject this option due to their extensive scarring and surgical aggressiveness.

Conclusions

The application of BTX-A associated with REPA allowed solving the DR W3 and midline hernia with suture of the rectus sheath with less tension, associated with a reinforcement prosthesis, allowing a reduced hospitalization with a low level of postoperative pain and avoiding irreversible muscle release incisions, not exempt from morbidity, apart from the proven benefits of endoscopic access.

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Ethical approval
This study was approved by the Bioethics Committee and chair of the board of the Public Maternal and Child Hospital SE of Salta, by virtue of decrees No. 3962/10 and 30/20, with identification according to internal provision No. 1852/21.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1. Mota P, Pascoal AG, Sancho F, Bø K. Test-retest and intrarater reliability of 2-dimensional ultrasound measurements of distance between rectus abdominis in women. J Orthop Sports Phys Ther 2012;42:940-6.
2. Juárez Muas DM, Palmisano E, Pou Santoja G, Cuccomarino S, González Higuera G, Mayo P, *et al*. Preaponeurotic endoscopic repair (REPA) as treatment of the diastasis of the recti associated or not to hernias of the middle line. Multicenter study. Rev Hispanoam Hernia 2019;7:59-65. DOI: 10.20960/rhh.194.
3. Reinpold W, Köckerling F, Bittner R, Conze J, Fortelny R, Koch A, *et al*. Classification of rectus diastasis – A proposal by the German Hernia Society (DHG) and the International Endohernia Society (IEHS). Front Surg 2019;6:1.
4. Moreno-Egea A. Abdominoplasty and incisional hernia repair: What a general surgeon should know. Rev Hispanoam Hernia 2016;4:5-12.
5. Juárez Muas DM. Preaponeurotic endoscopic repair (REPA) of diastasis recti associated or not to midline hernias. Surg Endosc 2019;33:1777-82.
6. Juárez Muas D, Verasay G, García Walter M. Endoscopic Prefascial Repari of the Recti Diastasis Description of New Technique. Rev Hispanoam Hernia. 2017;5:47-51.
7. Ibarra Hurtado T. Toxina botulínica A: Botulinum toxin type A: Its importance in patients with large abdominal hernias Rev hispanoam hernia 2014;2:131-2. DOI: 10.1016/j.rehah.2014.05.003.
8. Chávez-Tostado K, Cárdenas-Lailson L, Pérez-Trigos H. Results of preoperative application of botulinum toxin type A in treatment of giant incisional hernias. Rev hispanoam hernia 2014;2:145–151.
9. Palmisano E, Mustone O, Pou Santoja G, Juárez Muas D, Blanco M. Preoperative infi ltration with botulinum toxin serotype A in the repair of ventral hernias with size defects between 10-15 cm: multicenter study. Rev hispanoam hernia 2020; 8:162-167.
10. Hernández López A, Villalobos Rubalcava E. Botulinum toxin type A infiltration in the preoperative preparation of hernias with 10-15 cm defects. Rev hispanoam hernia 2016;4:43-9.
11. Ibarra-Hurtado TR, Nuño-Guzmán CM, Echeagaray-Herrera JE, Robles-Vélez E, de Jesús González-Jaime J. Use of botulinum toxin type a before abdominal wall hernia reconstruction. World J Surg 2009;33:2553-6.
12. Daes J. Endoscopic subcutaneous approach to component separation. J Am Coll Surg 2014;218:e1-4.