Ventral hernia reconstruction with botulinum toxin and pneumoperitoneum. A case report

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Case Report

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Background: Objective: To describe the successful surgical management of a 10 × 15 cm VHLD through a sequential abdominal preconditioning protocol (BTA + PP) followed by ventral hernia repair using the Rives-Stoppa technique with placement of a polypropylene mesh in the retromuscular (sublay) position.
Case presentation: An 82-year-old male patient with a history of laparotomy performed 2 years earlier for complicated appendicitis, who subsequently developed an incisional ventral hernia with loss of domain and a hernia sac of 9.8 cm in diameter confirmed by computed tomography (CT) was evaluated. A sequential protocol was implemented consisting of: 1) ultrasound-guided infiltration of 100 IU of BTA into the oblique musculature of the abdominal wall; and 2) placement of a catheter for PP with intermittent insufflation until a cumulative volume of 4,700 cc was reached. In the fifth week, ventral hernia repair using the Rives-Stoppa technique was performed with placement of a 10 × 10 cm polypropylene mesh in the retromuscular (sublay) position. The postoperative course was favorable, without abdominal compartment syndrome or recurrence at discharge.
Conclusions: The combined protocol of BTA and PP prior to Rives-Stoppa repair enabled tension-free fascial closure and safe retromuscular prosthetic mesh placement in an octogenarian patient with VHLD. The integration of abdominal wall prehabilitation techniques represents a valuable tool in the armamentarium of the general surgeon for highly complex cases.

Keywords: ventral hernia with loss of domain; botulinum toxin type A; progressive pneumoperitoneum; Rives-Stoppa technique; abdominal wall reconstruction; general surgery.

Ventral hernia with loss of domain (VHLD) is a clinical entity defined by the impossibility of returning the herniary contents to the abdominal cavity without producing intra-abdominal hypertension, respiratory compromise, or vascular compromise of the protruding intestinal loops (1). This condition represents approximately 20% of complex ventral hernias and is associated with recurrence rates of up to 30–40% when approached with conventional repair techniques without preconditioning strategies (2).

The concept of "loss of domain" was introduced by European hernia surgeons — initially by Sabbagh et al. in France and subsequently revisited by Mayo, Bellón, and Wantz — to describe situations in which more than 20–30% of the abdominal contents reside permanently outside the cavity and the abdomen has lost its capacity to accommodate them (3). In these cases, simple reduction and fascial closure is associated with high morbidity, including abdominal compartment syndrome, fascial dehiscence, hernia recurrence, and cardiopulmonary complications (4).
In order to avoid these complications, multiple abdominal wall preconditioning strategies have been described, among which botulinum toxin type A (BTA) and progressive pneumoperitoneum (PP) stand out (5). BTA, originally used for aesthetic purposes and for the treatment of muscular spasticity, induces a transient chemical paresis of the lateral abdominal musculature, which favors muscle elongation and medialization of the midline (6).

The sequential combination of both techniques, followed by repair with retromuscular hernioplasty (Rives-Stoppa technique or later variants), has demonstrated a significant reduction in perioperative complications and mid-term recurrence rates (7). The present report describes the successful management of a patient in the ninth decade of life with a supraumbilical VHLD who was subjected to this combined protocol.

Case report

An 82-year-old male patient (medical record GOEJ440318), retired, residing in Tijuana, Baja California, evaluated at the outpatient clinic of the Department of General Surgery of the Hospital General Fray Junípero Serra (ISSSTE). Among his chronic-degenerative background, the following stand out: systemic arterial hypertension of 20 years' evolution under treatment with telmisartan-amlodipine, benign prostatic hyperplasia under tamsulosin and dutasteride, insomnia managed with escitalopram, and a history of leukemia in remission since one year prior to consultation. In the surgical history, the patient had undergone exploratory laparotomy 2 years earlier for complicated appendicitis (generalized peritonitis and pelvic abscess), and six months prior to consultation he had been operated on for a fronto-temporal basal cell carcinoma through wide resection and reconstruction with a Limberg flap. He denies substance use and has no known drug allergies.

He presented for the first time to specialized evaluation in General Surgery on May 7, 2026, referred after observing progressive growth of an abdominal mass over the past 18 months, measuring approximately 15 × 10 cm, which reduced in the

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Figure 1. Preoperative application of botulinum toxin type A into the abdominal wall musculature (May 14, 2026). The dermographic planning marks over the lateral abdominal wall and the ultrasound-conducting gel are observed, which delimit the infiltration points of the oblique muscles according to the technique described by Ibarra-Hurtado et al.

supine position and protruded with standing and exertion. He denies pain, color changes, obstructive symptoms, or alteration of intestinal transit. On physical examination, a globose abdomen at the expense of the adipose panicle was identified, together with a defect of the ventral wall at the supraumbilical midline with a central catheter placed for insufflation, present peristalsis, and tense on expansion by the previously instituted therapeutic pneumoperitoneum, without signs of peritoneal irritation.



Figure 2A. Pneumoperitoneum catheter in anterior view (June 10, 2026). The device is observed fixed with 2-0 nylon at the Palmer point (left hypochondrium).



Figure 2B. Pneumoperitoneum catheter in oblique lateral view. The same disposition of the catheter and the insufflation system is appreciated, confirming adequate fixation, with a three-way system for intermittent insufflation of ambient air.

Abdominopelvic computed tomography (CT) dated April 23, 2026 confirmed the presence of a supraumbilical midline defect with a wide-neck hernia sac and a transverse diameter of approximately 9.8 cm, the contents of which corresponded to intestinal loops, fat, and mesentery.

A follow-up CT performed on June 19, 2026, after the establishment of therapeutic pneumoperitoneum and under the Valsalva maneuver, demonstrated a hernia ring of approximately 95 mm in transverse diameter, a hernia sac predominantly occupied by induced pneumoperitoneum, and mild protrusion of the intra-abdominal content toward the defect, without evidence of incarceration or vascular compromise.



Figure 3. Pre-surgical marking (June 22, 2026). Clinical view in the supine position with the dermographic delimitation of the aponeurotic defect (10 × 15 cm), the midline references, and the

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Figure 3. Contd. pneumoperitoneum catheter in situ prior to its intraoperative removal.

After diagnostic confirmation, a sequential abdominal preconditioning protocol was instituted that included two outpatient procedures prior to the definitive reconstruction.

On May 14, 2026 — five weeks prior to the scheduled reconstruction date — outpatient application of BTA was performed with a total dose of 100 IU into the oblique musculature of the abdominal wall. The infiltration was carried out under ultrasound guidance, with prior identification of the muscular planes and distribution of the toxin at the sites demarcated on the lateral abdominal wall, in accordance with the preoperative planning. The procedure was performed with the objective of favoring transient chemical relaxation of the lateral musculature and reducing tension along the suture line during hernioplasty. Figure 1 shows the marking and preoperative disposition of the infiltration points.

On June 10, 2026, under sedation and local anesthesia, with prior asepsis and antisepsis and placement of sterile drapes, a catheter for therapeutic pneumoperitoneum was placed via Veress needle puncture at the Palmer point, with catheter positioning by the Seldinger technique. Initial insufflation of 400 cc of ambient air into the abdominal cavity was performed without complications, fixing the catheter with 2-0 nylon and verifying hemostasis. Beginning the following day, intermittent insufflation was initiated every 24 hours, with loads of 300–500 cc of ambient air, until a cumulative volume of 4,700 cc was reached on the day prior to the reconstructive surgery. Figures 2A and 2B illustrate the position and maintenance of the catheter in anterior and oblique lateral views.

On June 22, 2026, under balanced general anesthesia and after prior asepsis, antisepsis, and placement of sterile drapes, the scheduled ventral hernia repair was performed. An elective approach to the abdominal wall was performed, identifying a large ventral hernia with loss of domain and an aponeurotic defect of approximately 10 × 15 cm, the sac of which contained intestinal loops and fat-mesenteric tissue (Figure 3). Dissection by planes was performed, with release of the hernia sac and lysis of adhesions according to intraoperative findings.

After reduction of the herniary contents into the abdominal cavity and verification of the integrity of the loops and mesentery, reconstruction of the abdominal wall was performed using the Rives-Stoppa technique. The bilateral retromuscular space was developed until an adequate plane for prosthetic placement was obtained, with preservation of the rectus sheaths and the vasculonervous pedicles. Midline approximation with fascial closure without excessive tension was achieved, which was attributed to the combined effect of the preconditioning protocol. Figure 4 shows the reconstruction of the midline after bilateral medialization of the components.

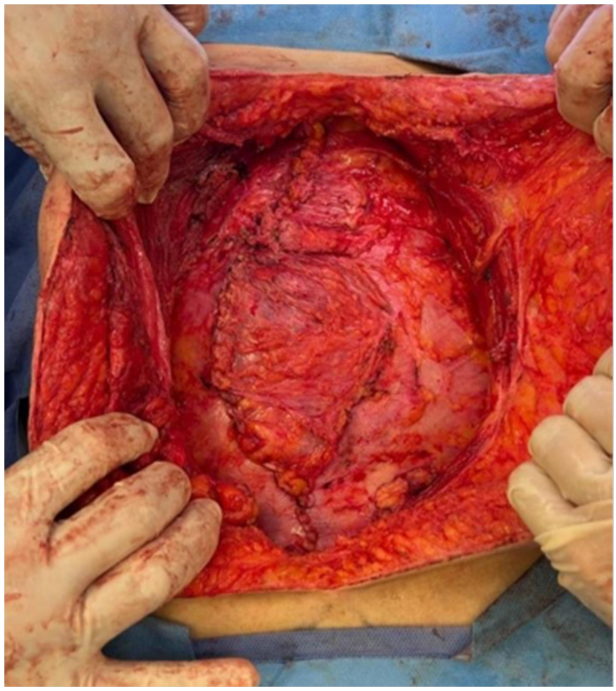


Figure 4. Retromuscular space developed and reconstructed midline (June 22, 2026). Intraoperative image showing the bilateral retromuscular (sublay) plane after dissection of the musculofascial components and the approximation of the midline at reduced tension, demonstrating the effect of preconditioning with BTA and PP.

Next, a 25 × 25 cm polypropylene mesh was placed in the retromuscular position, with adequate coverage and sufficient overlap over the defect. The prosthesis was extended and fixed in the previously developed space, remaining completely contained by the medialized rectus sheaths (Figure 5). Hemostasis was verified, absence of visceral injury and adequate disposition of the prosthesis were confirmed, proceeding to closure of the subcutaneous cellular tissue and skin. The final count of gauze, compresses, and instruments was reported as complete.

Total operative time was 2 hours and 30 minutes, and the anesthesia lasted 3 hours. Intraoperative bleeding remained within expected parameters and no transfusions were required. The patient was transferred to the recovery room with stable vital signs and subsequently to the hospital ward, where he evolved without signs of abdominal compartment syndrome, with serial C-reactive protein (CRP) values within normal limits, tolerance of the oral route at 24 hours, and hospital discharge on the second postoperative day without acute complications. Outpatient follow-up at two weeks showed the surgical wound in good condition, without clinical

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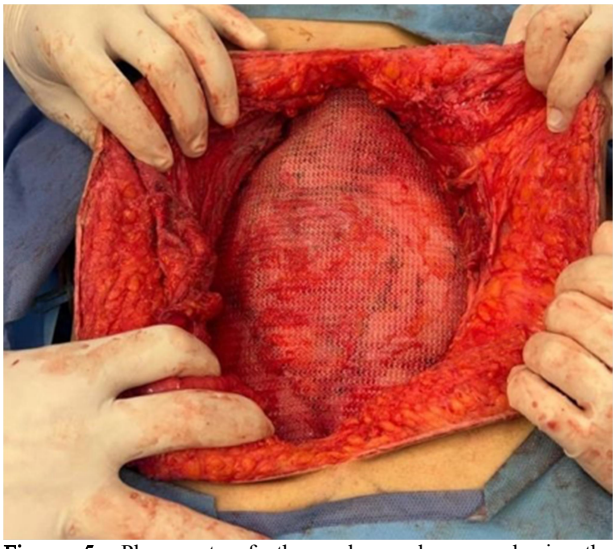


Figure 5. Placement of the polypropylene mesh in the retromuscular (sublay) position (June 22, 2026). The prosthesis extends symmetrically over the medialized aponeurotic defect, with complete overlap and coverage by the rectus sheaths, in accordance with the principles described by Rives, Stoppa, and Wantz for the repair of complex ventral hernias.

evidence of seroma, surgical site infection, or early hernia recurrence.

Discussion

Surgical management of ventral hernia with loss of domain constitutes a genuine challenge for the general surgeon. The classic definition of "loss of domain" implies that a significant proportion of the abdominal contents resides chronically in the hernia sac, thereby conditioning a reduction in the capacity of the abdominal cavity. When primary closure without preparation is attempted, the tension force on the suture line and the acute increase in intra-abdominal pressure may trigger fascial dehiscence, hernia recurrence, abdominal compartment syndrome, and severe cardiopulmonary complications (3,4).

In this context, the reported patient, aged 82, with a history of laparotomy for abdominal sepsis and concomitant chronic diseases, met multiple unfavorable factors that fully justified the adoption of a preconditioning protocol.

Preoperative application of botulinum toxin type A into the abdominal wall musculature results in elongation of the lateral muscle fibers (obliques and transversus), reduction of resting tension, and facilitation of medialization of the rectus muscles during fascial closure (8).

Progressive pneumoperitoneum constitutes the second fundamental tool for abdominal preconditioning. It should be noted that PP is not without risks: cases of pneumothorax, subcutaneous emphysema, air embolism, and inadvertent intestinal perforation during puncture have been described. The use of the Veress technique at the Palmer point and the Seldinger approach, as employed in this case, has been shown to be safe provided they are performed under ultrasound guidance and with continuous clinical monitoring.

In a recent systematic review involving more than 5,000 patients, retromuscular repair (Rives-Stoppa and its variants) showed significantly lower recurrence rates compared with onlay and inlay techniques, with figures ranging between 4 and 12% at 5 years, versus recurrences of up to 30% with other techniques (9). In the present case, the choice of the conventional Rives-Stoppa technique, without the need for component separation, was made possible by the combined effect of preconditioning with BTA and PP, which allowed medialization of the components with acceptable tension.

Conclusion

The present case illustrates the feasibility and safety of the combined protocol of botulinum toxin type A and progressive pneumoperitoneum as a preoperative strategy in an octogenarian patient with ventral hernia with loss of domain. The combined application of both techniques facilitated medialization of the musculofascial components and allowed definitive repair using the Rives-Stoppa technique with mesh placement in the retromuscular position, without the need for anatomical component separation or diversion of the abdominal wall toward more complex techniques. The postoperative course was favorable, without abdominal compartment syndrome or early hernia recurrence.

The integration of abdominal prehabilitation strategies should be considered part of the therapeutic armamentarium in VHLD, particularly in patients with comorbidities or in whom a conventional repair would carry a high risk of complications. Institutional protocolization of these techniques and the development of comparative studies that permit establishing conclusions with a higher level of evidence are recommended.

Conflicts of interests

None declared by the authors

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