



RECLAIMING THE ABDOMINAL CAVITY: MULTI-MODAL MANAGEMENT OF A GIANT INCISIONAL HERNIA WITH LOSS OF DOMAIN

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ABSTRACT

Giant incisional hernias with loss of domain (LOD) remain a complex challenge in abdominal wall reconstruction due to the difficulty in achieving safe reduction of herniated viscera and tension-free fascial closure. We present the management of a giant LOD incisional hernia using a multimodal approach combining preoperative abdominal wall conditioning and definitive reconstruction. A 76-year-old man with a long-standing incisional hernia following previous pancreatic surgery underwent preoperative optimization with botulinum toxin A injection and progressive pneumoperitoneum to improve abdominal wall compliance and increase intra-abdominal capacity. This was followed by abdominal wall reconstruction using component separation, primary fascial closure, and retrorectus mesh reinforcement. Although the patient developed postoperative skin flap necrosis, appropriate wound management resulted in successful healing. This case highlights the importance of individualized preoperative planning and a staged multimodal strategy in managing complex loss-of-domain hernias, where optimization techniques can facilitate safe and effective abdominal wall reconstruction.

KEYWORDS : Giant Incisional Hernia; Loss Of Domain; Botulinum Toxin A; Progressive Pneumoperitoneum; Component Separation; Retrorectus Mesh; Abdominal Wall Reconstruction.

INTRODUCTION

Incisional hernia is a frequent late complication of abdominal surgery, resulting from failure of the abdominal wall to heal adequately after laparotomy. Its occurrence is influenced by several patient-related factors, including advanced age, obesity, diabetes mellitus, chronic kidney or liver disease, malnutrition, immunosuppression, peripheral vascular disease, and smoking. The reported incidence of incisional hernias following abdominal operations ranges between 3.8% and 11.5%. [1,2]

A subset of these hernias progresses to a giant incisional hernia with loss of domain (LOD), a condition in which a considerable proportion of the abdominal viscera permanently resides within the hernia sac. This anatomical alteration poses significant challenges during surgical repair, as reintegration of the herniated contents into the abdominal cavity may lead to excessive intra-abdominal pressure and respiratory compromise. Computed tomography (CT)-based volumetric assessment is commonly used to quantify LOD, with a hernia sac volume exceeding 50% of the abdominal cavity volume generally considered indicative of significant loss of domain. [3]

Repair of giant incisional hernias with LOD remains one of the most demanding procedures in abdominal wall reconstruction. These complex defects are associated with increased perioperative morbidity, recurrence rates of up to 30%, and reported mortality ranging from 0% to 5%. [4] Recent advances in preoperative optimization, including botulinum toxin A-induced chemical relaxation of the lateral abdominal wall muscles and progressive preoperative pneumoperitoneum, have improved the likelihood of achieving tension-free fascial closure. When combined with component separation techniques and mesh-based reinforcement, these strategies have expanded the surgical options available for managing complex abdominal wall defects.

Case Presentation

A 76-year-old man presented to our hospital with a one-month history of abdominal discomfort. He had progressive abdominal wall deformity (Figures 1 and 2), which had

gradually increased in size over the past 24 years following a laparotomy for pancreatic surgery, the details of which were unavailable. His medical history was significant for hypertension, type 2 diabetes mellitus, and obesity, with a body mass index (BMI) of 32.5 kg/m².

Routine laboratory investigations revealed a normal hemoglobin level with no evidence of leukocytosis. Arterial blood gas analysis was within normal limits.

On physical examination, a well-healed midline laparotomy scar was noted. The abdomen was markedly distorted and pendulous, with a large overhanging ventral swelling. Small epigastric and supraumbilical bulges were present on either side of the scar, along with a much larger bulge involving the umbilical and infraumbilical regions. The hernia demonstrated an expansile cough impulse, was non-tender, and showed no palpable pulsations or signs of peritoneal irritation. The hernia contents were clinically consistent with bowel loops.

Contrast-enhanced computed tomography (CT) of the abdomen (Figures 3 and 4) revealed three separate midline ventral abdominal wall defects. The first defect, located in the epigastric region, measured 4.5 × 2 cm and contained herniated intra-abdominal fat. The second defect, measuring 4 × 6.5 cm in the supraumbilical region, contained the transverse colon. The third and largest defect, measuring 10 × 10.5 cm in the umbilical and infraumbilical region, contained bowel loops and omental fat. The loss of domain was calculated to be 45% using the Sabbagh method.

In view of the significant loss of domain, preoperative optimization was undertaken. Botulinum toxin A was injected into the lateral abdominal wall muscles to induce temporary muscle relaxation and facilitate medial advancement of the abdominal wall. Forty days later, a peritoneal dialysis catheter was inserted through Palmer's point under an intercostal nerve block (Figure 5), following which progressive pneumoperitoneum (PPP) was performed over a period of three days. During this period, the patient was kept nil per oral and received total parenteral nutrition.

Definitive surgical repair was subsequently performed under general anesthesia. The patient underwent laparotomy, anterior component separation, primary anatomical closure of the fascial defects, and retrorectus (sub lay) mesh placement (Figures 6 and 7). Postoperatively, intravesical pressure and abdominal girth were monitored to detect any evidence of abdominal compartment syndrome. Pharmacological prophylaxis against deep vein thrombosis was also initiated.

The postoperative recovery was initially uneventful. The patient was mobilized on postoperative day 2, total parenteral nutrition was gradually discontinued, and oral intake was resumed, beginning with liquids and advancing to a soft diet. He was discharged in stable condition on postoperative day 3.

Ten days after discharge, the patient presented with discoloration and necrosis of the mobilized abdominal skin flaps (Figure 8). Surgical debridement of the necrotic tissue was performed (Figure 9), followed by regular wound care and dressing changes. After healthy granulation tissue had developed and the wound condition had improved, delayed primary closure was successfully performed (Figure 10). At one-year follow-up (Figure 11), the patient remained clinically well and reported no abdominal discomfort or functional limitations. There was no evidence of recurrence, and no lateral abdominal wall herniation was observed. The abdominal wall reconstruction remained intact with satisfactory functional and cosmetic outcomes.



Figure 1



Figure 2

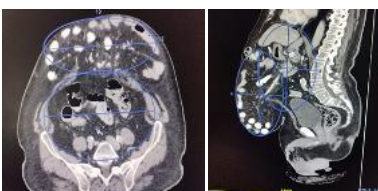


Figure 3,4



Figure 5



Figure 6

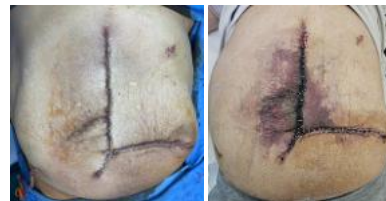


Figure 7,8



Figure 9,10



Figure 11

DISCUSSION

Giant incisional hernias with loss of domain (LOD) represent one of the most challenging conditions in abdominal wall reconstruction. Long-standing herniation results in progressive retraction of the lateral abdominal wall

musculature and adaptation of the abdominal cavity to a reduced visceral volume. Consequently, reduction of the herniated viscera may lead to increased intra-abdominal pressure, postoperative respiratory compromise, and abdominal compartment syndrome if not adequately anticipated and managed. Therefore, successful repair requires careful preoperative planning and optimization to facilitate tension-free fascial closure while minimizing physiological complications [5,6].

Loss of domain is a radiological concept that describes the proportion of abdominal viscera residing permanently within the hernia sac relative to the abdominal cavity. Computed tomography-based volumetric assessment is considered the gold standard for preoperative evaluation. Among the available methods, the Sabbagh technique is widely used to quantify LOD and guide operative planning. Patients with an LOD greater than 20–25% are generally considered candidates for adjunctive preoperative techniques because of the increased risk of difficult fascial closure and postoperative abdominal compartment syndrome [7,11]. In our patient, the calculated LOD was 45%, indicating a complex giant ventral hernia requiring staged preoperative optimization.

Botulinum toxin A (BTA) has become an important adjunct in the management of complex ventral hernias. By inducing temporary flaccid paralysis of the external oblique, internal oblique, and transversus abdominis muscles, BTA increases abdominal wall compliance, elongates the lateral musculature, and facilitates medial advancement of the rectus muscles. This concept of "chemical component separation" was first described by Ibarra-Hurtado et al., who demonstrated significant elongation of the lateral abdominal muscles after preoperative BTA injection [5]. Subsequent systematic reviews have reported improved rates of primary fascial closure, reduced closure tension, and a decreased requirement for extensive surgical component separation in patients receiving preoperative BTA [9].

Progressive pneumoperitoneum (PPP), first described by Goñi Moreno in 1947, is another valuable adjunct in the treatment of giant loss-of-domain hernias [6]. Gradual insufflation of air into the peritoneal cavity expands the abdominal cavity, increases diaphragmatic compliance, and allows progressive physiological adaptation before definitive repair. In addition, PPP may facilitate adhesiolysis through pneumodissection and reduce the risk of postoperative abdominal compartment syndrome. However, the technique requires close monitoring because complications such as pneumothorax, pneumomediastinum, subcutaneous emphysema, bowel injury, and catheter-related infections have been described [6,10].

Recent studies suggest that the combination of BTA and PPP provides synergistic benefits in patients with giant ventral hernias. While BTA relaxes the lateral abdominal wall muscles and improves abdominal wall compliance, PPP progressively expands the abdominal cavity and enhances cardiorespiratory adaptation. Together, these techniques increase the likelihood of achieving primary fascial closure with reduced tension while minimizing the need for more extensive reconstructive procedures. Bueno-Lledó et al. and Elstner et al. demonstrated that this combined approach is associated with high fascial closure rates, acceptable morbidity, and favorable postoperative outcomes in patients with significant loss of domain [8,10].

Following adequate preoperative optimization, our patient underwent anterior component separation with primary fascial closure reinforced by retrorectus mesh placement. Component separation remains an effective reconstructive technique when tension-free midline closure cannot otherwise be achieved. Although posterior component separation with

transversus abdominis release (TAR) has become increasingly popular because of lower wound morbidity, anterior component separation continues to provide satisfactory outcomes in appropriately selected patients [12]. Furthermore, placement of mesh in the retrorectus (Rives–Stoppa) plane is considered the preferred technique because it offers excellent mesh incorporation, broad overlap of the defect, lower recurrence rates, and fewer infectious complications compared with onlay repair [13,14].

The postoperative skin flap necrosis encountered in our patient represents a recognized complication of anterior component separation, largely attributable to disruption of the perforating blood supply during extensive subcutaneous flap dissection [14]. Prompt debridement, meticulous wound care, and delayed primary closure resulted in satisfactory wound healing without compromising the integrity of the abdominal wall reconstruction.

Long-term follow-up is essential in patients undergoing complex abdominal wall reconstruction, as recurrence, mesh-related complications, and lateral abdominal wall bulging remain important concerns. Although anterior component separation carries a potential risk of lateral abdominal wall weakness due to disruption of muscular and neurovascular structures, our patient remained clinically well at one year follow-up, with no evidence of recurrence or development of lateral abdominal wall hernia.

This case highlights the importance of a multimodal approach in the management of giant incisional hernias with significant loss of domain. Comprehensive preoperative assessment, CT-based volumetric analysis, chemical component separation with botulinum toxin A, progressive pneumoperitoneum, and definitive abdominal wall reconstruction using component separation with retrorectus mesh enabled successful tension-free fascial closure while avoiding abdominal compartment syndrome. Our experience supports the growing evidence that combining preoperative BTA and PPP is a safe and effective strategy for optimizing outcomes in complex abdominal wall reconstruction [8–10].

CONCLUSIONS

Successful reconstruction of giant incisional hernias with significant loss of domain requires restoration of the balance between abdominal cavity capacity and herniated visceral volume. In this patient, preoperative abdominal wall conditioning with botulinum toxin A combined with progressive pneumoperitoneum facilitated safe reduction of the hernia contents and enabled tension-free fascial closure with anterior component separation and retrorectus mesh reinforcement. Although postoperative skin flap necrosis occurred, timely wound management resulted in satisfactory healing. At one-year follow-up, the patient remained asymptomatic with no evidence of hernia recurrence, mesh-related complications, or lateral abdominal wall herniation. This case reinforces the importance of CT-based preoperative assessment, individualized optimization, and a multimodal reconstructive strategy for achieving durable outcomes in patients with complex loss-of-domain abdominal wall defects.

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