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10.4103/ijawhs.ijawhs_89_24

Complex parastomal hernia repair combining double mesh and abdominal wall component separation – A case report and tips for success

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Abstract

INTRODUCTION: The development of post-operative abdominal compartment syndrome is one of the major risks associated with the repair of massive parastomal hernias. Minimizing the occurrence of such post-operative complications is imperative but challenging. Plastic surgery techniques in complex hernia repairs can offer significant advantages in such complex surgeries.

CASE PRESENTATION: We present a case of a 26-year-old, obese, non-smoking male with a massive left-sided parastomal hernia extending below the inguinal region. The hernia was confirmed on a pre-operative computed tomography (CT) and seen to include most of the remaining bowel area. Pre-operative optimization of the abdominal wall was performed by ultrasound-guided botulinum toxin injections to all three abdominal wall muscles bilaterally. The surgery was performed in three steps involving the reduction of the hernia, abdominal wall component separation, closure of the abdominal wall with dual mesh placement, de-epithelization and folding of excess abdominal skin, and repositioning of the stoma. Post-operatively, the patient was followed-up for pain, ventilatory problems, and increasing abdominal pressures.

CONCLUSION: Massive parastomal hernia repair avoiding post-operative abdominal compartment syndrome can be achieved by application of a multi-dimensional surgical approach. The use of pre-operative Botox represents an innovative approach that may reduce the risk of post-operative complications.

Keywords:

Botox, case report, component separation, double mesh, massive parastomal hernia

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Submitted: 14-Nov-2024

Revised: 10-Apr-2025

Accepted: 17-Apr-2025

Published: 30-Sep-2025

Introduction

The incidence of parastomal hernia after end-ileostomy varies between 1.8 and 28.3%.^[1] The management of massive parastomal hernias requires a multi-dimensional surgical approach to minimize the risk of recurrences and other life-threatening post-operative complications. For this purpose, various treatment strategies have been reported, including mesh reinforcements, component separation technique (CST), and pre-

operative intramuscular Botulinum toxin A (BTA) injections.^[2,3] The major devastating complications associated with massive hernia repairs are intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS), which may cause fatal multi-organ failure and lead to mortality in 90% of cases.^[4,5] CST combined with pre-operative BTA injections has emerged as a novel measure to reduce the risk of post-operative ACS development and recurrence rates.^[6]

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How to cite this article: Al-Hilli O, Glaumann C, Dimovska EOF, Ghanipour L. Complex parastomal hernia repair combining double mesh and abdominal wall component separation – A case report and tips for success. *Int J Abdom Wall Hernia Surg* 2025;8:201-6.

Herein, we present a case of massive parastomal hernia repaired by CST and dual mesh technique with preoperative preparation with BTA injection.

Case Report

A 26-year-old, obese, non-smoking male with Crohn's disease (currently unmedicated) was referred to the general surgery and plastic surgery departments at Uppsala University Hospital Sweden for the management of a large parastomal hernia extending below the inguinal region [Figure 1]. His previous surgical history indicated left-sided hemicolectomy with a right-sided ileostomy in 2011 and a completion right-sided hemicolectomy in 2014 with a left-sided ileostomy. Soon thereafter, abdominal protrusion began, resulting in the development of a massive parastomal hernia over the next 7 years, leading up to his referral.

The hernia was confirmed on a pre-operative computed tomography (CT) and seen to include most of the remaining bowel area. The abdominal wall defect from the hernial protrusion was expected to be at least 15 cm, and both abdominal wall component

separation and mesh re-enforcement were planned for. The patient was optimized pre-operatively by ultrasound-guided (BTA) injections 6 weeks before surgery. A total of 200 units (Botulinum Toxin Type A, Allergan) were given to the abdominal wall in three rows and to all three layers of the muscles (external oblique, internal oblique, and rectus abdominis) in 2 units/2 mL injections. This would serve to relax the abdominal wall, ease the component separation, and limit the risk of post-operative abdominal compartment syndrome. [Figure 2].

Surgical technique

The surgery was performed in three steps in a joint collaboration between general and plastic surgeons, involving reduction of the hernia, abdominal wall component separation, and closure of the abdominal wall with repositioning of the stoma. An initial laparotomy gained access to the abdominal wall defect, through which the herniated bowel could be pulled back [Figure 3]. The stomal opening on the skin and the final herniated bowel were excised and pulled out from the hernial sac and skin [Figure 4]. Approximately 7 meters of the small bowel remained, of which 0.5 meters was excised to lessen the intra-abdominal pressure upon



Figure 1: Massive parastomal hernia (left-sided) extending below the inguinal area

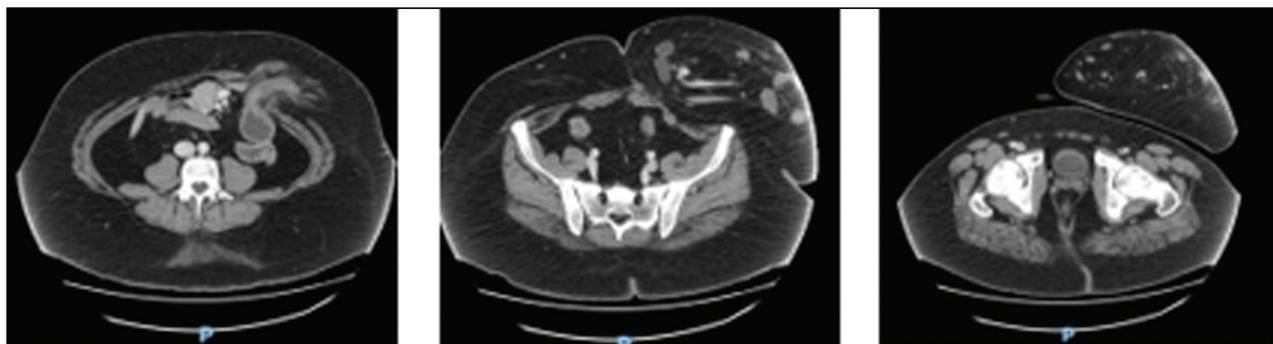


Figure 2: Coronal section of the computed tomography scan from the proximal to distal abdominal wall demonstrating the hernial sac with intestinal contents

subsequent closure. The hernial sac and a small part of the omentum were also excised. The abdominal wall defect was seen to be much smaller than expected, about



Figure 3: A midline laparotomy gained access to the hernial defect, through which the herniated bowel was pulled back and released from the hernial sac

5 cm. An anterior abdominal wall component separation followed, releasing the external oblique muscle on the ipsilateral left side (lateral to the abdominal wall defect) and on the contralateral right side [Figure 5]. This enabled full abdominal closure after the hernial defect was closed, but in order to prevent post-operative abdominal compartment syndrome, complete closure of the rectus abdominis muscles was opted against. Instead, a Rives–Stoppa repair was performed, where the posterior abdominal wall separation was performed and the fascia from behind both rectus abdominis muscles was released, folded toward the midline, and closed over the bowel. A biological mesh, Permacol (20 × 30 cm), was applied to the posterior fascial closure [Figure 6]. The rectus abdominis muscles were subsequently approximated, and a synthetic mesh, Dynamesh (15 × 5 cm) was applied as on-lay cover [Figure 7]. Abdominal compartment pressure was measured throughout, using a urinary catheter-based abdominal pressure measuring device, and ventilation pressures and carbon dioxide retention levels were monitored. The redundant skin was not aggressively excised in order to reduce healing issues, but a V-shaped area was laterally de-epithelialized and folded/invaginated in order to flatten the area and remove a big lateral dog ear. Performing a de-epithelialization rather than excision served to increase the preservation of blood supply to the abdominal skin flap, particularly since redundant skin was excised inferiorly. Staging surgery, particularly for improving aesthetics as in the described case, and opting for tension-free closure are classic plastic surgery teachings: “Though shalt not commit tension” and “Though shalt not do today, what one can honorably put

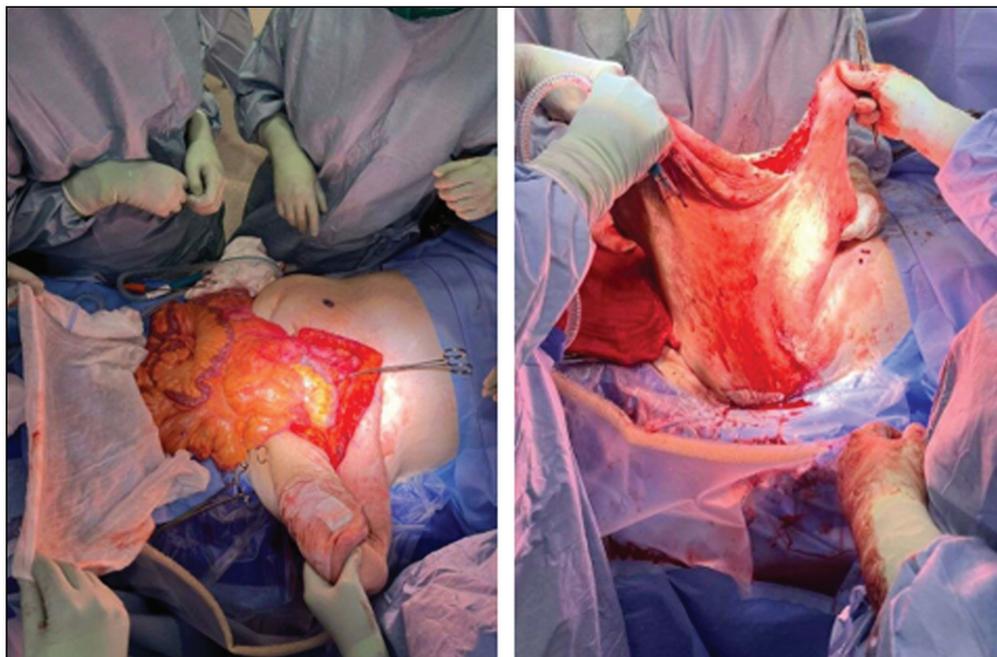


Figure 4: The stomal opening on the skin and the final herniated bowel were excised and pulled out from the hernial sac and skin

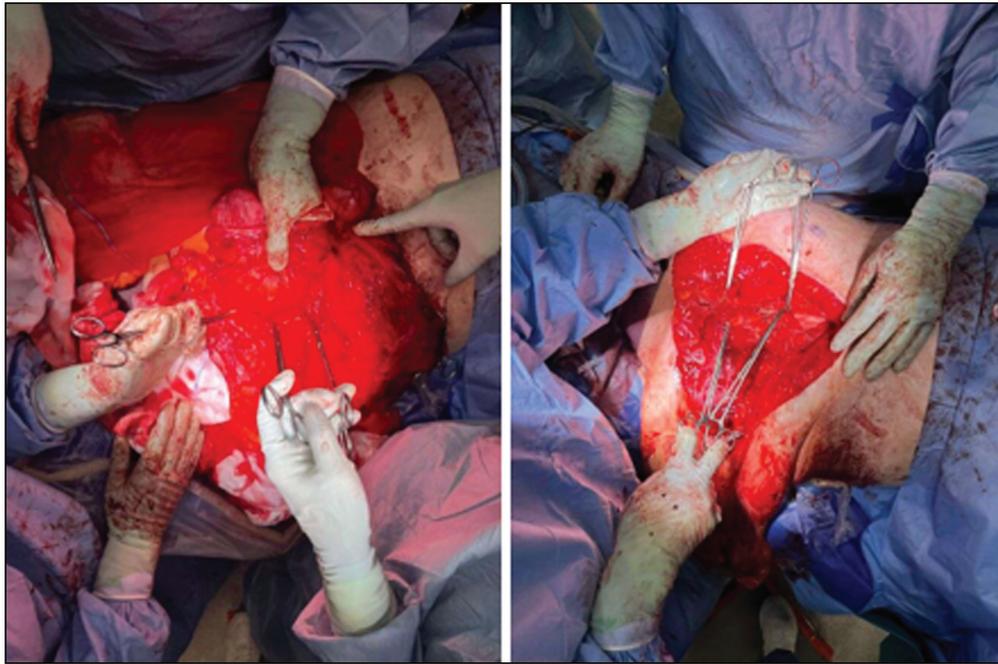


Figure 5: Anterior abdominal wall component separation which achieved central abdominal wall closure; however, an additional posterior wall separation was performed



Figure 6: A biological mesh was applied to the posterior fascial closure prior to central abdominal wall closure (left picture). A synthetic online mesh was applied as on-lay cover (right picture)

off until tomorrow.” Following abdominal wall closure, but prior to full skin closure, the stoma was replaced at a new right-sided position. The site of the stoma was pre-operatively marked by a qualified stomal nurse therapist. The patient was kept sedated in intensive care overnight, had a nasogastric tube, analgesia, and was monitored for ventilatory problems and rising abdominal pressures (above 15 mm Hg).

Discussion

Parastomal hernias, after end-ileostomies, are frequent post-operative complications with significant morbidity and high recurrence rate. Several surgical techniques have been proposed for large parastomal hernia management, primarily focusing on mesh reinforcements and component separation techniques.^[6-8] Mesh

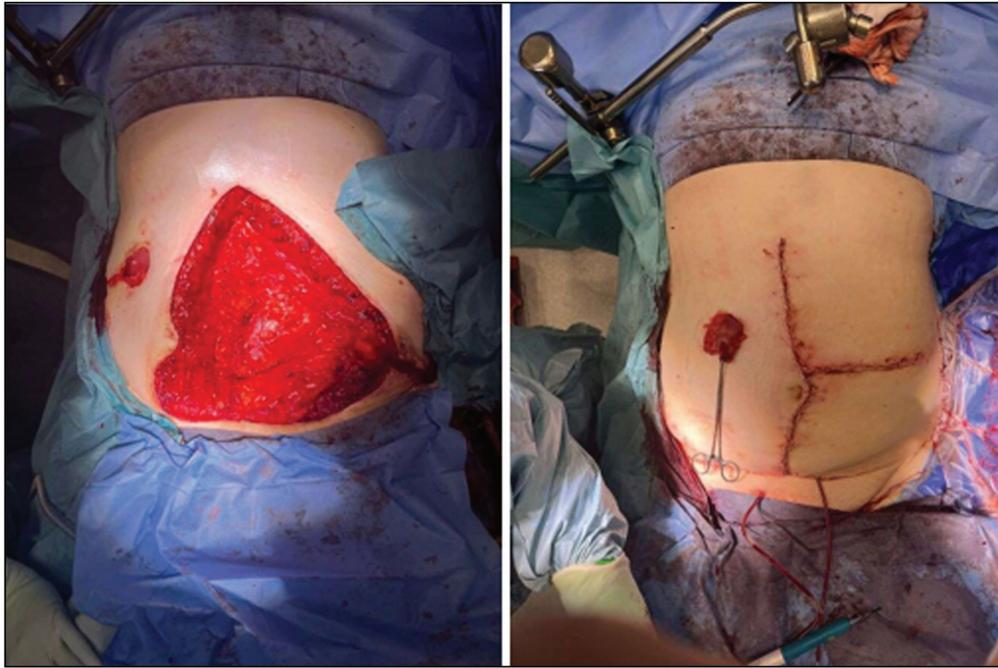


Figure 7: Final skin defect with lateral V-shaped de-epithelization, invaginated folding, and final vertical midline and horizontal closure

reinforcements have been found to provide significantly better structural support with lower recurrence of hernia compared to primary suture repair.^[2] Dual mesh has been found to offer superior outcomes in terms of the strength and recurrence compared to single-material mesh.^[9]

A major risk associated with the repair of massive parastomal hernias is the development of IAH and ACS, which can cause mortality due to multi-organ failure.^[4] Pre-operative BTA in combination with component separation has been found to reduce the occurrence of ACS by reducing the muscle amplitude, herniated volume, and hernia width.^[3,6] It is recommended for high-risk hernia repairs with a cutoff horizontal diameter of >10 cm, contracted lateral abdominal wall muscles, long-standing laparostomas, and muscle calcification to reduce the tension and improve the surgical closure.^[10] The recommended dosages of BTA are 100–500 IU, injected into 3–5 injection sites.^[11]

Progressive pre-operative pneumoperitoneum (PPP) is another option for loss of domain (LOD) cases to reduce the muscular tension in large hernia with a risk of developing ACS, but it comes with a risk of post-operative bacterial peritonitis or intra-abdominal abscess development.^[12]

Component separation is an effective approach for large abdominal hernias without significant morbidity to the abdominal wall integrity and function as it provides more room for tension-free closure.^[13] In cases of perceived high-tension closure, as in this case,

mesh placement can be applied without full closure to prevent hernia recurrence.^[9] Integration of innovative techniques from plastic surgery massive hernia repairs can offer significant advantages in complex cases, where wound healing is paramount, and extensive undermining of skin flaps with multiple incisions can cause unwanted soft tissue necrosis and infections. In large hernia LOD cases with risk of ACS development, bowel resection is also indicated to reduce the volume of the abdominal contents, which facilitates the safe harbor of hernia contents, restoration of the LOD, and tension-free surgical site closure.^[14] However, the anastomotic stricture or leaks can lead to devastating post-operative complications causing morbidity, longer hospital stay, or even death in severe cases.^[15] Therefore, to reduce the risk/benefit, non-resective pre-operative procedures are often preferred while reducing the large hernia. BTA and PPP strategies are comparatively safer, facilitating tension-free closure while preserving bowel integrity and improving surgical outcomes.^[16]

Key tips for limiting post-operative abdominal compartment syndrome in massive stomal hernia repairs.

Pre-operative

- Botulinum toxin injections to multiple sites over the lateral abdominal wall and all three abdominal wall muscles, using ultrasound guidance: 2–6 weeks prior to surgery.
- If possible, reduction of the hernia and use of abdominal girdle to prepare for the post-operative re-arrangement of the intra-abdominal organs
- Mesh selection: biological, synthetic, or both?

Intra-operative

- Constant monitoring of abdominal compartment pressures via a urinary catheter
- Resection of redundant omentum +/- bowel to limit intra-abdominal contents
- Constant ventilation pressure and carbon dioxide retention monitoring
- Perform tension-free closure and stage skin excisions for aesthetic purposes

Post-operative

- Consider keeping patients sedated overnight
- Have a good analgesic plan – consider abdominal wall analgesic catheters
- Decompress the bowel by placing a nasogastric tube and limiting initial oral feed
- Abdominal binder up to 3 months

Author contributions

O.A.H: Writing original, and formal analysis. C.G.: Writing – review & editing, resources and supervision. E.O.F.D: Conceptualization, supervision, methodology, writing-review & editing, project administration, and resources. L.G.: Writing – review & editing, resources, and supervision..

Ethical policy and institutional review board statement

Not applicable.

Declaration of patient consent

The authors certify that written informed consent was obtained from the patient for publication of this case report, including accompanying images and clinical details. The patient understands that anonymity cannot be guaranteed but efforts have been made to conceal their identity.

Data availability statement

All data relevant to this case report are included in the manuscript. Additional anonymized details can be provided by the corresponding author upon reasonable request.

Financial support and sponsorship

None.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgments

None.

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