Case Report with Review of Literature

Laparoscopic intraperitoneal onlay mesh repair for a large obstructed ventral incisional enterocele

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ABSTRACT

Laparoscopic bridging repairs of ventral hernias have now been largely replaced by fascial suture closure followed by prosthetic reinforcement because the latter is biomechanically and functionally superior to the former. Although initially performed for relatively smaller defects, these repairs are now performed for defects of varying dimensions. This has been greatly facilitated by the development of barbed sutures. We present the case of a 94-year-old woman who presented with small-bowel obstruction. Examination and imaging revealed a large obstructed ventral incisional hernia. She underwent totally laparoscopic repair and had an uneventful post-operative recovery.

Key words: Barbed suture, Bridging repair, Hernia, Incisional hernia, Laparoscopy, Ventral hernia

Ventral hernias continue to be a common cause of surgical complications worldwide and are characterized by the protrusion of abdominal viscera through a defect in the abdominal wall fascia. The estimated lifetime risk of developing an abdominal wall hernia in the community is approximately 4–5% for primary hernias, while incisional hernias are comparatively more common, with a reported complication rate of 11–20% following open laparotomy [1]. The incidence is influenced by demographic and biological factors. Obesity (high body mass index [BMI]), male sex, old age, and associated diseases such as chronic obstructive pulmonary disease and diabetes mellitus greatly increase the risk. Patients typically present with asymmetrical, visible or palpable distension of the abdominal wall that worsens with activities that increase intra-abdominal pressure, such as coughing and straining. Localized pain or discomfort and skin changes, along with a feeling of core instability, are common associated symptoms. Severe presentations include acute strangulation or incarceration, presenting with severe abdominal pain, nausea, and vomiting.

The rationale for reporting this case is to demonstrate the feasibility of managing even large, complicated hernias occurring at the site of previous surgery by a totally laparoscopic approach and to share our experience.

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CASE REPORT

A 94-year-old woman presented to the emergency department with chief complaints of acute abdominal pain, abdominal distension, vomiting, and constipation. She was apparently well until 3 days before presentation, when she developed acute colicky pain in the central abdomen, accompanied by nausea, vomiting, and abdominal distension. She had been constipated for 7 days and had been obstipated for 1 day.

On examination, her pulse rate was 96 beats/min, blood pressure was 130/90 mmHg, and respiratory rate was 15 breaths/min. Her BMI was 20 kg/m^2, and she had no comorbidities. Her abdomen was distended, tympanitic, and hyperperistaltic. She also had a large, irreducible ventral hernia in the lower abdomen at the site of the lower half of a previous midline incision. Further inquiry revealed that she had undergone Wertheim's hysterectomy for uterine cancer 30 years earlier. Per-rectal examination revealed an empty rectum.

Contrast-enhanced computed tomography (CECT) was performed and revealed a large segment of small bowel entrapped within the hernia. A diagnosis of obstructed incisional enterocele was made, and laparoscopic repair, with the possibility of conversion to open repair if required, was discussed with the patient and her family.

On preoperative anesthesia evaluation, she was classified as American Society of Anesthesiologists physical status II. After the necessary investigations, she was taken up for surgery. She was placed in the supine position. On laparoscopy, the CECT findings

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were confirmed. The contents of the large hernia were meticulously reduced by sharp dissection, avoiding the use of any energy source to prevent iatrogenic injury to the entrapped small bowel (Fig. 1). After complete reduction, the large vertical hernia defect was closed intracorporeally using No. 1 Stratafix® suture (Ethicon Inc., USA) (Fig. 2). A 30 × 30 cm dual Merineum® mesh (Meril Inc., India) was then introduced into the abdominal cavity, optimally spread over the suture line, and fixed to the parietes using an absorbable tacker (Fig. 3). The greater omentum was then spread over the small bowel beneath the mesh, and the procedure was completed. The entire operation was performed using four trocars (two 10-mm and two 5-mm trocars). The two 10-mm trocars were inserted at the level of, and on either side of, the umbilicus along the linea semilunaris. The two 5-mm trocars were inserted on either side of the left 10-mm trocar to achieve optimal triangulation toward the lower abdomen.

Her post-operative recovery was uneventful, and she passed flatus on post-operative day (POD) 2. She was initially started on oral liquid feeds, followed by semisolid feeds, which she tolerated well. After bowel movements resumed, she was discharged from the hospital on POD 5. At her POD 10 outpatient follow-up visit, her wounds had healed well. At the time of writing, a telephonic follow-up was conducted 6 months after surgery, and she remained asymptomatic.

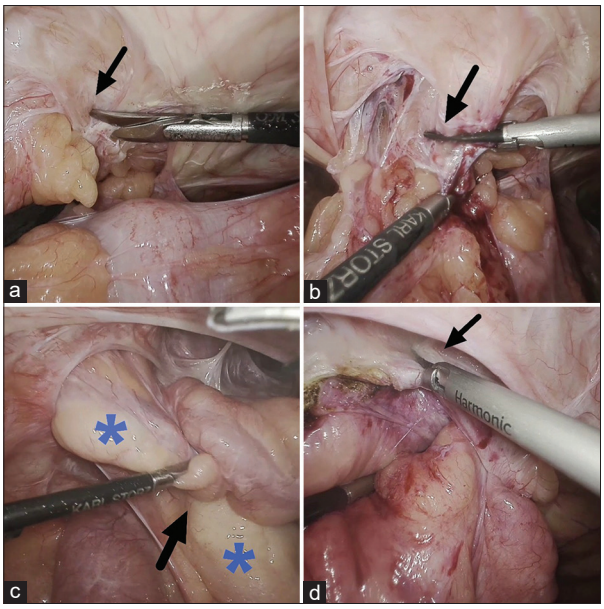

Figure 1: (a-c) Adhesiolysis (black arrows) of small bowel (blue asterisks) by "cold" cutting; (d) Harmonic scalpel being used to divide fibrotic septa (black arrow) within the hernial defect to facilitate reduction of tightly incarcerated small bowel within the hernia without iatrogenic injury

DISCUSSION

The use of tension-free placement of a synthetic prosthesis as a bridge or reinforcement to repair the damaged myofascial wall has been a mainstay of hernia repair for many years. A major development occurred in 1992, when LeBlanc and Booth described and performed the first laparoscopic repair of ventral hernias using a technique called intraperitoneal onlay mesh (IPOM) [2]. Before the advent of this technology, ventral hernia repairs through an open approach required extensive mobilization of subcutaneous tissue, placing patients at increased risk of post-operative surgical-site infections, skin necrosis, and prolonged hospital stays. The main attraction of the classical IPOM approach was its ability to avoid many of these wound-related problems through a minimally invasive approach, with excellent visualization of multifocal fascial defects and broad circumferential mesh overlap. Nevertheless, the traditional IPOM approach has several mechanical limitations. The traditional

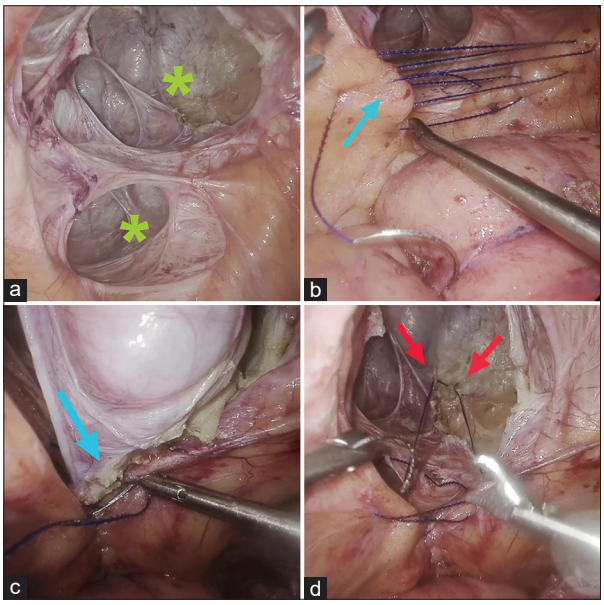

Figure 2: (a) Large ventral hernial bare defect (green asterisks) after complete reduction of entrapped contents; (b) Ventral herniorrhaphy in progress using No. 1 barbed suture (blue arrow); (c and d) Hernia sac being included in the sutures so as to reduce dead space (blue and red arrows)

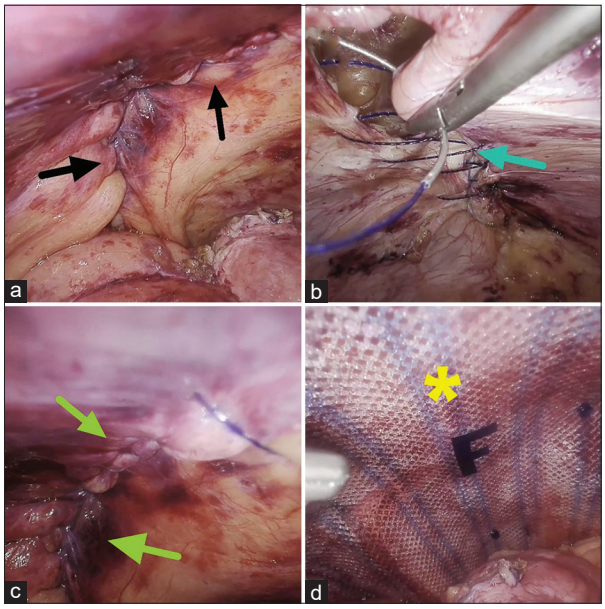

Figure 3: (a) Completed suture line lower - half (black arrows); (b) Suture closure of upper half of defect (blue arrow); (c) Completed suture closure (green arrows); (d) Mesh optimally placed *in situ* and fixed to parietes (yellow asterisk)

method does not close the primary defect but instead uses the mesh as a dynamic bridge. This may result in a high incidence of seroma formation within the redundant hernial sac postoperatively, as well as mesh eventration into the defect owing to intraperitoneal pressure. The shift from conventional IPOM to IPOM Plus, described by Kukleta, represents a major change in the approach to minimally invasive abdominal wall reconstruction. IPOM Plus requires closure of the fascial defect before intraperitoneal mesh placement [3].

Various clinical comparisons have shown that fascial closure with heavy, delayed-absorbable or non-absorbable transfascial monofilament sutures, such as Prolene or Polydioxanone, reduces the occurrence of post-operative fluid collections [3]. Fascial closure may also decrease the likelihood of recurrence in the long term; according to a retrospective analysis, the adjusted odds ratio for 6-month recurrence following bridged IPOM repair was 14.86 times that following IPOM+ repair [1]. Re-approximation of the linea alba or rectus sheath restores functional tension in the abdominal wall muscles. This helps prevent the creation of dynamic dead space, which can contribute to seroma formation, as well as mesh stretching or eventration into the defect [1].

Simultaneously, the history of IPOM has been closely linked to advances in biomaterials. Because the mesh comes into direct contact with intra-abdominal organs, the use of non-functionalized synthetic polymers was found to result in excessive bowel adhesions. Consequently, composite and barrier meshes were developed. Karl LeBlanc's early attempts were based on expanded polytetrafluoroethylene (ePTFE), which was selected because of its chemical inertness and low tissue adherence. However, the use of pure ePTFE resulted in poor integration with the parietal abdominal wall and increased susceptibility to infection. This initiated a period of biomaterial engineering that resulted in the development of composite meshes. The current generation of prostheses contains a macroporous structural layer (e.g., polypropylene or polyester), which encourages collagen ingrowth toward the parietal wall, along with an absorbable or non-absorbable visceral barrier layer facing the bowel. The barrier provides temporary protection for bowel loops from the synthetic material during the healing phase of the peritoneum, which lasts approximately 7–14 days. In addition to biomaterial considerations, fixation remains an important issue. Previously, surgeons used a double-crown method involving titanium tacks along with transfascial sutures [4].

Although mechanically sound, this highly invasive technique can lead to focal ischemia of the abdominal wall and nerve entrapment, resulting in significant acute and chronic post-operative pain. The development of absorbable tacks made from polyglycolic acid or poly-L-lactic acid, along with self-retaining micro-gripping mechanisms, has reduced some markers of chronic pain; however, fixation-related neuralgia remains a disadvantage of this approach. These technological advances aim to achieve a balance between mechanical security and a reduction in chronic post-operative pain.

However, IPOM Plus differs considerably in terms of risk profile from the classical open abdominal wall reconstruction procedure known as the Rives-Stoppa repair, which was developed in the 1960s–1970s by French surgeons Jean Rives and René Stoppa. Open sublay repair uses a non-barrier mesh positioned in the retromuscular plane. Biomechanically, in the Rives-Stoppa procedure, intra-abdominal forces push the posterior rectus sheath against the mesh, thereby splinting the mesh without the need for fixation devices. The prosthesis remains outside the abdominal cavity, thereby avoiding the risks of adhesions and fistula formation [5]. When compared directly with open Rives-Stoppa repair, IPOM+ takes significantly less time (approximately 1.3 times faster) and is associated with nearly half the intraoperative blood loss [6]. Post-operative pain is also significantly lower during the early post-operative period following IPOM+ than after open Rives-Stoppa repair [6]. However, classic open Rives-Stoppa repair involves the creation of large skin flaps and extensive tissue dissection, which may increase the risk of morbidity related to superficial wounds. It was in response to these limitations that the concept of extended-view totally extraperitoneal Rives-Stoppa (eTEP-RS) repair was developed [7]. The eTEP-RS technique is essentially an endoscopic or robotic adaptation of the Rives-Stoppa technique.

The latest evidence from randomized controlled trials and comparative studies suggests that although IPOM Plus is associated with shorter operating times and technical ease, eTEP-RS may be superior in terms of patient outcomes [4,8]. Patients undergoing extraperitoneal retromuscular repair may experience less pain in the immediate post-operative and chronic phases because of the absence of transfascial tacks, along with shorter hospital stays and reduced overall costs [8]. Equally important, the retromuscular approach completely separates the mesh from the abdominal contents, eliminating potential complications such as bowel perforation, enterocutaneous fistula formation, and adhesive obstruction, which may occur with transperitoneal IPOM techniques [7].

Laparoscopic and robotic IPOM+ are valuable and efficient techniques, particularly for mild-to-moderate midline defects or when extensive extraperitoneal dissection is not advisable because of previous surgery. The development of this technique, which originated from LeBlanc's original bridging concept, represents continued efforts to preserve abdominal wall function.

However, as advances in endoscopic and robotic platforms promote wider adoption of completely extraperitoneal retromuscular repair (eTEP-RS), the role of IPOM+ in clinical practice is changing. As future developments in hernia surgery place greater emphasis on techniques that ensure complete isolation of biomaterial

from the peritoneal cavity, IPOM+ may become a more selective procedure.

CONCLUSION

As demonstrated in this case, even a seemingly difficult large obstructed ventral hernia at the site of previous surgery, with incarcerated bowel as its contents, can be safely managed using a totally laparoscopic approach in an appropriately equipped setting and by a surgical team with advanced laparoscopic skills.

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