Case Report

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Going beyond traditional methods: Dual component separation in giant incisional hernia surgery: A case report

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Abstract

Large ventral hernias, often with significant defects and loss of domain, present a challenge even for experienced surgeons. Traditionally, surgical management of large incisional hernias involves tension-free mesh repair, either via open or laparoscopic methods. Bridging these defects has involved artificial prostheses. However, failure to close the midline can lead to adverse effects on posture, respiration, micturition, defecation, and overall biomechanical function, severely affecting the patient's quality of life. Albanese *et al.* first proposed a model for abdominal wall component separation in 1951, which was later refined by Ramirez *et al*. in 1990 through a cadaveric study. This technique offers a novel approach to closing midline defects by utilizing native, vascularized tissue—either alone or in combination with prosthetic materials. Over time, this technique has evolved, incorporating various modifications, including anterior and posterior component separation. Component separation has become more widely used, with ongoing modifications aimed at addressing the key challenges of the technique. Hence, here we present a case of a 42-year-old male with a large ventral hernia at the site of midline abdominal surgery performed a decade earlier. The hernia was successfully repaired using a combination of anterior and posterior (dual) component separation techniques, complemented by mesh reinforcement, resulting in a satisfactory outcome and restoring the patient's functional capacity and quality of life. In conclusion, for complex cases, dual component separation techniques may be used to facilitate defect closure, ensuring abdominal wall integrity and promoting recovery while minimizing complications and recurrence.

Keywords:

Case report, dual component separation technique (dCST), giant incisional hernia, midline abdominal surgery, ventral hernias

Introduction

In recent decades, significant advancements have been made in the reconstruction and repair of large ventral hernias, yet a consensus on the most effective closure method remains lacking. Repairing complex abdominal wall hernias has historically been linked to high rates of morbidity and recurrence. For primary repairs, recurrence rates initially ranged from 24% to 54%, with mesh repairs showing a 24% recurrence rate and suture repairs at 43%.[1] While mesh repairs have generally led to improved recurrence rates, the use of mesh has been associated with various comorbidities. Furthermore, an increasing number of patients are surviving severe intra-abdominal events, resulting in abdominal wall defects and complications such as chronic infections, enterocutaneous fistulas, poor wound healing, or excessive tension on the repair, which can increase the likelihood of recurrence.[2]

As a result, there is a clear need for a reliable technique for abdominal wall reconstruction that minimizes morbidity and recurrence. To address these issues and reduce recurrence

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and morbidity in abdominal wall reconstruction, the component separation technique was introduced. This method was described in a cadaveric model by Ramirez *et al*.[3] and has been effectively used to repair complex abdominal wall defects with mesh placement.[4] Large ventral hernias with wide defects cannot be closed directly. Traditionally, these defects are bridged using artificial prostheses (onlay, sublay, or intraperitoneal onlay). However, leaving defects open can lead to significant physiological disturbances.[5] We present an approach for closing midline defects using the combination of onlay mesh placement and the dual component separation technique (dCST) of large ventral hernias. This approach enables the closure of defects up to 20 cm wide at the waistline. The purpose of this study is to evaluate both the early and long-term outcomes of the technique.

Case History

A 42-year-old male presented with a complaint of swelling over the abdomen, typically in the midline region extending from just above the umbilicus to the suprapubic region, 2 years back, gradually increasing in size over the span of the next 2 years. The bulge often becomes more pronounced when the patient stands, coughs, or strains. Symptoms varied from mild discomfort or a sensation of heaviness to more severe pain, particularly during physical activity. The bulge was partially irreducible but was not incarcerated nor had any signs of bowel obstruction. The patient gave a history of previous midline abdominal surgery 10 years back—details unknown, with no history of comorbidities.

On clinical examination, a prominent mid-abdominal swelling was identified, presenting as a large, visible, and palpable hernia measuring 22 cm × 18 cm, located along a previous scar between the epigastric and suprapubic regions [Figures 1 and 2]. The hernia was soft and partially irreducible on manual palpation. The overlying skin appeared stretched but showed no signs of discoloration or ulceration [Figure 3] The hernia felt soft, with no tenderness upon palpation. A positive cough impulse was observed, with the bulge increasing in size during coughing. Bowel sounds were audible, and there were no indications of strangulation, such as pain, fever, nausea, or systemic distress. A contrast-enhanced computed tomography of the abdomen and pelvis revealed a large defect in the anterior abdominal wall, with herniation of bowel loops and omentum through a defect neck measuring 20.9 cm. Laboratory tests, including blood cell count, urine sediment analysis, liver function, kidney function, electrolytes, and blood sedimentation, were all within normal limits.

Therapeutic intervention: Repair of a giant abdominal incisional hernia is challenging. Various surgical techniques with varying success have evolved over the years without a defined technical superiority of one over the other.[6] We describe our approach to these demanding cases through a combined onlay synthetic mesh placement with dCST.

The patient underwent surgery under general anesthesia along with epidural catheterization for postoperative

Figure 1: Abdominal wall with giant incisional hernia (supine view)

Figure 2: Abdominal wall with giant incisional hernia (lateral view, standing position)

Figure 3: Abdominal wall with giant incisional hernia (stretched skin; no ulceration)

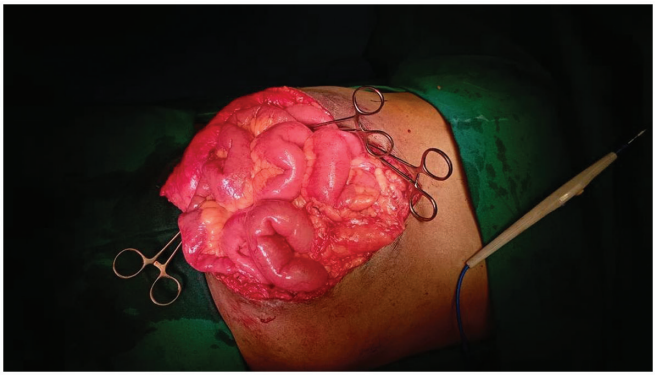

Figure 4: Laparotomy with exposure of the intestinal content after excision of the giant hernial sac

analgesia. The incision was midline, excising the previous scars. Thorough adhesiolysis was done, and all the contents were reduced into the abdomen [Figure 4]. The size of the defect measured 20 cm in length and 13 cm in width at the point of umbilicus. For midline approximation and closure of the defect, due to the wide margin of the defect, dual component separation was done beginning with the anterior component separation technique. The skin flaps were raised by about 10 cm beyond the midline. The external oblique was divided 2 cm lateral to the linea semilunaris, vertically, and separated from the internal oblique allowing medialization of the rectus.

The anterior separation was completed and found to be inadequate for tension-free closure. Hence, the decision was taken to proceed with posterior component separation, wherein the transversus abdominis is released medial to the linea semilunaris to expose a broad plane that extends from the central tendon of the diaphragm superiorly to the space of Retzius inferiorly and laterally to the retroperitoneum [Figure 5]. A light polypropylene mesh 30 cm by 30 cm was put in as the onlay method [Figure 6]. A total of 16F suction drains were put in the subcutaneous plane, and the skin was closed. The postoperative course was uneventful with close watch on the development of abdominal compartment syndrome, atelectasis, and deep vein thrombosis.

Immediate postoperative care was carried out in the postanesthetic recovery unit. The patient was moved after 4 h to the general surgery area with intravenous analgesia. He was discharged on the fourth day after surgery with adequate oral intake, adequate control of pain, and in the absence of any major complications. Follow-up was carried out by serial clinical evaluation for 2 years.

Follow-up and outcomes: The patient stayed in the hospital for 5 days after the operation. Patient-controlled analgesia was no longer required after the first postoperative day. Return of bowel function was achieved within 3 days postoperatively. The patient's recovery went well without significant complications postoperatively.

Discussion

Repairing large ventral hernias presents a significant challenge, even for experienced surgeons, due to the extensive defects that are difficult to close. Historically, large defects were addressed using techniques such as myofascial flaps or free flaps, which often resulted in high recurrence rates and complications. Albanese first described anterior component separation (ACS) by releasing the insertion of external oblique muscles.[7] More recently, these defects are bridged with artificial prosthetics (either laparoscopically or through open surgery), although the defects are often left open.[8] However, leaving the midline unclosed can negatively impact abdominal wall function. The abdominal wall serves several vital roles, such as protecting internal organs and supporting the spine. In a recent report, 29 patients were treated with a combination of ACS and posterior component separation (PCS) by the release of external oblique muscle through debatable

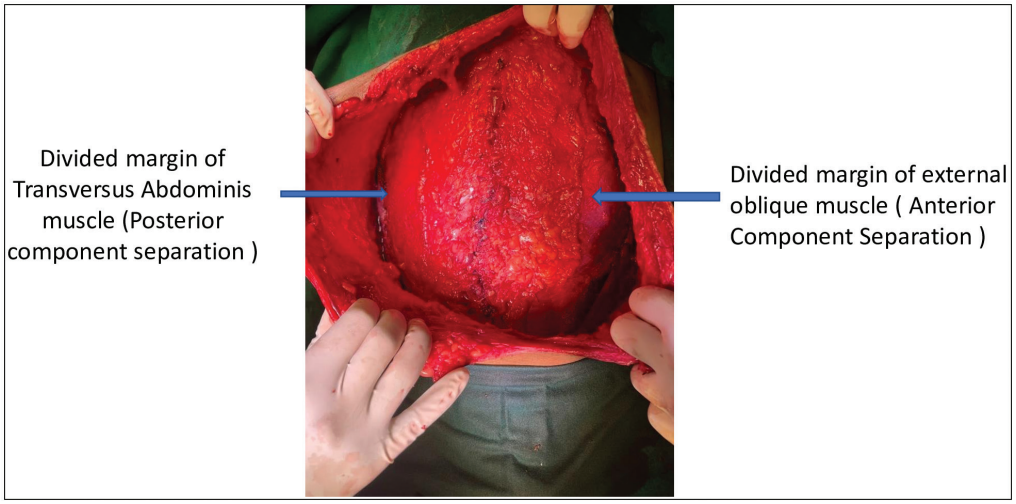

Figure 5: Closure of the hernial defect after dual component separation

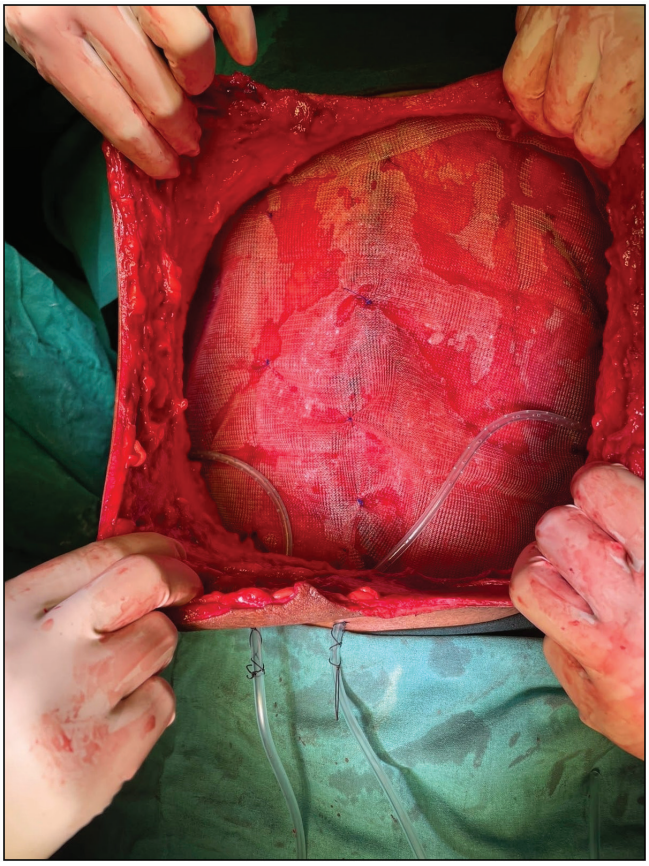

Figure 6: A total of 30 cm × 30 cm mesh with ONLAY placement anchored 5 cm outside of the limit of the hernial ring after tension-free closure

posterior access between neurovascular bundles.[9] Additionally, the dynamic abdominal muscles are involved in various physiological activities, including coughing, urination, defecation, and childbirth, and they play a crucial role in controlling satiety by resisting the expansion of the stomach, thereby preventing overeating.

Patients with previous ACS repair who develop recurrence and pose a significant challenge are addressed by PCS/transversus abdominis release.[10] Previously, the combined use of ACS and PCS in cases of massive incisional hernias has been studied in exceptional circumstances where the closure of the abdominal wall poses a significant challenge.[11] The combined use of mesh placement and the component separation technique is gaining preference in the repair of giant incisional hernias, as it facilitates tension-free closure and lowers the risk of recurrence.[12] The onlay mesh provides strong reinforcement to the abdominal wall, reducing the risk of recurrence by supporting the weakened tissue and allowing for more robust closure. It is placed over the defect, creating a durable barrier that ensures the hernia repair remains stable over time.

The dCST, which involves mobilizing the abdominal muscles by separating the posterior rectus sheath from the underlying structures, facilitates a tension-free closure of large hernia defects. This method allows for better mobilization of the abdominal wall, minimizing the risk of tension at the repair site, which can otherwise lead to wound dehiscence or recurrence.[12,13]

Together, these techniques provide a comprehensive approach to hernia repair, addressing both the structural defect and the underlying muscle tension. Studies have demonstrated that this combined approach not only reduces the likelihood of hernia recurrence but also improves functional outcomes and accelerates postoperative recovery for patients. As such, it remains a valuable option in managing complex abdominal wall defects.[13,14] Performing a proper ACS and PCS results in a stable lateral musculature, ruling out future lateral wall hernias, with further enhancement by adding a small bridged repair.[15]

Patient perspective: For patients, undergoing surgery to repair a giant incisional hernia evokes a blend of relief, anxiety, and hope. While they anticipate pain relief and a return to normal activities, fears about surgery, anesthesia, and potential complications, such as recurrence, can cause stress. Concerns about recovery, including pain, scarring, and healing time, are common, as well as worries about the financial and emotional impact. However, trust in the surgeon and the prospect of improved quality of life often encourage patients to move forward with the procedure.

Conclusion

In conclusion, the combination of onlay mesh placement and the dCST provides a highly effective solution for repairing giant incisional hernias. The onlay mesh offers strong reinforcement, reducing recurrence risk and enhancing long-term results. Meanwhile, component separation improves abdominal muscle mobilization, allowing for tension-free closure of large defects. Together, these approaches tackle the challenges of giant hernias, increasing the chances of a successful repair, minimizing complications, and promoting better postoperative recovery and functional outcomes for patients.

Author contributions

We certify that we have participated sufficiently in the intellectual content, conception and design of this work or the analysis and interpretation of the data (when applicable), as well as the writing of the manuscript, to take public responsibility for it and have agreed to have our name listed as a contributor.

Ethical policy and institutional review board statement

On behalf of all the authors, I confirm that the study was performed in accordance with the "Declaration of Helsinki".

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Acknowledgments

Not applicable.

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