# Evaluation of component separation technique in the repair of complex large ventral hernia with large defects

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**Background**
Component separation technique was initially developed in 1990 by Ramirez and colleagues for reconstruction of large abdominal wall defects. The aim of this study was to report the effectiveness of this technique over 1-year follow-up.

**Patients and methods**
Sixteen patients were included in the study. The indications, operative details, and clinical outcomes were recorded. The mean operative time ranged from 140 to 210 min and the hospital stay ranged from 2 to 5 days. Postoperative complications were mild, and none of the studied patients had clinical recurrence during the follow-up period.

**Conclusion**
Component separation technique is a feasible procedure and effective in the repair of large abdominal wall defects.

**Keywords:**
abdominal wall, component separation, large hernia

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## Introduction

The term ventral is most commonly used to collectively describe those hernias that occur outside the groin, and that is what we mean in this study. Most of these hernias are small and can be repaired easily with standardized techniques. However, a subset of those patients develop a large sac with loss of domain. Repair of such types of mega ventral hernia with relative loss of domain within the abdominal cavity is technically challenging.

Component separation technique (CST) was initially developed in 1990 by Ramirez *et al.* [1] for reconstruction of large abdominal wall defects without the use of prosthetic materials. The technique separates the muscle components of the abdominal wall so that they can be mobilized and used to reconstruct midline deficiencies of the abdominal wall.

Primary ventral incisional hernia repair with sutures alone is associated with hernia recurrence rates ranging from 36 to 56% [2,3]. In this article we modified the technique with the application of prosthetic material onlay over the repair.

The aim of this study was to report the effectiveness of this technique over 1-year follow-up.

## Patients and methods

(1) Patients with large ventral hernia with wide defect were included in this study and prepared for component separation repair.
(2) All patients were subjected to complete history taking and clinical assessment, including cardiopulmonary assessment and laboratory investigations, and a computed tomography scan was obtained to assess the size of the hernia and the extent of loss of domain.
(3) Appropriate deep venous thrombosis prophylaxis was carried out.
(4) Operative data of all patients were recorded, including duration of the procedure, intraoperative complications, and associated procedure if any.
(5) Patients remained in the hospital following their surgery until they were ambulatory and their bladder and bowel functions were normal.
(6) Patients were followed up regularly for the first 3 months and then were followed up on an as-needed basis.
(7) During the follow-up period, patients were assessed for postoperative complications such as wound infection, wound dehiscence, mesh explantation, seroma, fistula formation, recurrence, etc.

### Surgical technique

(1) All surgical procedures took place under combined epidural and general anesthesia and patients



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received perioperative parenteral antibiotics with placement of pressure garments on both lower limbs. Low molecular weight heparin was given 12 h before surgery.
(2) Each patient required takedown of a large anterior abdominal hernia, and adhesions between peritoneum and small bowels were meticulously dissected.
(3) Patients were selected for component separation if the abdominal wall defect appeared to be not amenable to direct closure without tension.
(4) The abdominal skin flap was elevated at the midline, superior to the level of the costal margin and inferior to the symphysis pubis.
(5) At 2 cm lateral from the rectus sheath, the aponeurosis of external abdominal oblique muscle was longitudinally transected, and release of the abdominal musculature was performed in a sequential manner and only to an extent clinically necessary to close the abdominal wall defect without tension.
(6) The avascular plane between the external abdominal oblique muscle and the internal abdominal oblique muscle was separated and this was performed on either side.
(7) Tension-free closure of the abdominal wall defect was achieved using polydioxanone continuous running sutures and reinforced with interrupted Vicryl stitch.
(8) Finally, the repair was reinforced with an overlay mesh with a wide overlap.
(9) Suction drains were placed subcutaneously, and the subcutis and the skin were closed.
(10) The patients were instructed to wear an abdominal binder and to avoid heavy lifting for approximately 10 weeks.
(11) Suction drains remained *in situ* until the output was less than 30–50 ml in 24 h.

## Results

Sixteen patients were included in this study, 10 (65%) female and six (35%) male. Their ages ranged from 28 to 60 years, with a mean of 39.26 ± 9.38 years. The period of follow-up ranged from 9 to 18 months (Table 1).

Recurrent ventral hernia was the most common indication for repair of abdominal wall in seven patients. Other indications were exploration due to trauma in four patients, exploration due to peritonitis in three patients, exploration for distal pancreatectomy in one patient, and closure of colostomy and peritonitis in one patient. Duration since previous operation ranged from 8 months to 10 years.

Total operative time ranged from 130 to 210 min, with a mean of 140.45 ± 33.065 min. Hospital stay ranged from 2 to 5 days. One patient needed mechanical ventilation for 2 days during the immediate postoperative period.

Seven patients had no complications, whereas six patients developed seroma, which was managed with frequent aspiration in the outpatient clinic. Wound infection occurred in two patients and was managed conservatively with systemic and local antibiotics. Minor wound breakdown occurred in two patients and required debridement and secondary closure under local anesthesia. One patient developed wound hematoma and was managed conservatively with local fomentation and topical medications.

All studied patients had no clinical recurrence during the follow-up period and had acceptable cosmetic outcome.

## Discussion

Large ventral hernia is a common problem occurring in 11–20% of patients undergoing laparotomy [4]. There is no standardized definition of what represents a giant ventral hernia, but the major problem is inoperability. Repair of such huge ventral hernias with significant loss of domain is technically challenging, with high mortality, morbidity, and recurrences rates [5]. Herein, we presented our experience with the CST with an onlay mesh in the repair of giant ventral hernias with large defects.

Component separation was first popularized by Ramirez *et al.* [1] in the 1990s. It allows for a tension-free closure of the myofascial layers of the abdominal wall.

Several investigators have published good outcomes of CST for huge ventral hernia repair [6–8].

In this study, 16 patients were included and all of them had midline closure by means of component separation and an onlay mesh. We reported no recurrence rate over a mean period of 12.2 months of follow-up.

Sailes *et al.* [9] reported a recurrence rate of 18.5% at 10-year follow-up with an onlay mesh and we believe that an important step to reduce recurrence is to achieve tension-free midline closure of the linea alba. Abrahamson and Eldar [10] also reported the importance of recreating the linea alba to provide an anchor for the lateral abdominal wall anteriorly and to decrease the risk of recurrence.

Hultman *et al.* [11] reported a hernia recurrence rate of 19.8% at a mean follow-up of 4.4 years, whereas Thomas *et al.* [12] reported no recurrences.

**Table 1 The clinical data of the studied patients**

| Patient nos | Age | Sex | Type of previous operation | Duration since previous operation | Comorbidity | Type of wound incision | Type of mesh | Period of follow-up (months) | Postoperative complications |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 42 | Female | Exploration due to trauma | 2 years | Nil | Midline | Prolene | 18 | Nil |
| 2 | 36 | Female | Exploration due to peritonitis | 1 year | Nil | Midline | Ultrapro | 18 | Seroma |
| 3 | 40 | Female | Exploration for pancreatectomy | 8 months | Nil | Midline | Ultrapro | 17 | Seroma, minor wound infection |
| 4 | 51 | Male | Recurrent ventral hernia (puh) | 2 years | T2DM | Transverse | Ultrapro | 16 | Seroma |
| 5 | 50 | Male | Exploration due to peritonitis | 1 year | Nil | Midline | Ultrapro | 16 | Nil |
| 6 | 44 | Female | Recurrent ventral hernia (puh) | 3 years | Nil | Transverse | Prolene | 14 | Wound hematoma |
| 7 | 46 | Male | Exploration due to trauma | 10 years | HTN | Midline | Prolene | 14 | Nil |
| 8 | 59 | Female | Exploration due to peritonitis | 2 years | T2DM | Midline | Ultrapro | 13 | Seroma |
| 9 | 60 | Male | Recurrent ventral hernia (puh) | 4 years | T2DM, HTN, IHD | Midline | Ultrapro | 12 | Seroma, minor wound breakdown |
| 10 | 28 | Male | Exploration due to trauma | 1 year | Nil | Midline | Prolene | 12 | Nil |
| 11 | 50 | Female | Closure of colostomy and peritonitis | 1 year | Bronchial asthma | Midline | Prolene | 11 | Wound infection, seroma |
| 12 | 48 | Female | Recurrent incisional hernia | 2 years | Nil | Midline | Prolene | 11 | Nil |
| 13 | 32 | Female | Recurrent incisional hernia | 2 years | Nil | Midline | Ultrapro | 9 | Nil |
| 14 | 45 | Male | Exploration due to peritonitis | 2.5 years | Nil | Midline | Prolene | 9 | Seroma |
| 15 | 39 | Female | Recurrent incisional hernia | 3 years | Nil | Midline | Ultrapro | 8 | Minor wound breakdown |
| 16 | 35 | Female | Recurrent ventral hernia (puh) | 3 years | Nil | Transverse | Ultrapro | 8 | Nil |

T2DM, type 2 diabetes melitus; HTN, hypertension; IHD, ischemic heart disease

Slater *et al.* [13] reported a recurrence rate of 38.7% with component separation repair without mesh after a mean of 40.9-month follow-up, and this was significantly higher compared with that reported in the literature (14.0%, $P = 0.01$), and they concluded that mesh use decreases recurrence rate. This confirms our result as we believe that onlay mesh alongside with component separation is important to prevent long-term recurrence as shown by other investigators [14,15].

Wound complications such as dehiscence, infection, hematoma, and seroma have been reported in many studies [6,8].

In the present study, seroma was the most common postoperative complication occurring in six (37.5%) patients and it is mostly due to undermining of the subcutaneous tissues with creation of long flaps and creation of dead space during the CST. Moreover, minor wound breakdown occurred in three (18.7%) cases and wound hematoma occurred in one patient, and these minor complications were mostly due to the aforementioned factors.

Modifications of CST have been devised to improve outcomes, mostly based on minimizing subcutaneous undermining [16,17]. In the present study we attempted to decrease the dead space as much as we can and preserve the blood supply to skin flaps; moreover, the aponeurosis of external abdominal oblique muscle was longitudinally transected only to an extent clinically necessary to close the abdominal wall defect without tension.

## Conclusion and recommendations

CST is a suitable technique for repair of giant ventral hernias. Data are now available from large case series and with long-term follow-up, demonstrating the efficacy of this technique.

The present study demonstrated that it is a safe and effective technique with no recurrence rate throughout the follow-up period.

Limitations of this study include small number of cases and the short follow-up period, due to which the recurrence rates are probably underestimated.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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