



THE ROLE OF COMPONENT SEPARATION IN THE SURGICAL MANAGEMENT OF GIANT ABDOMINAL HERNIAS

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Abstract. Background: Giant abdominal wall hernias represent one of the most challenging conditions in reconstructive abdominal surgery. These hernias are associated with severe anatomical distortion, loss of abdominal domain, respiratory dysfunction, and impaired quality of life. Conventional tension-free repair alone is often insufficient to restore normal abdominal wall anatomy. Component separation techniques have significantly expanded reconstructive possibilities by enabling medial advancement of musculofascial layers without excessive tissue tension.

Objective: To review the anatomical basis, surgical techniques, clinical applications, advantages, limitations, and current role of component separation in the treatment of giant abdominal wall hernias.

Keywords: giant ventral hernia, abdominal wall reconstruction, component separation, transversus abdominis release, TAR, ventral hernia repair.

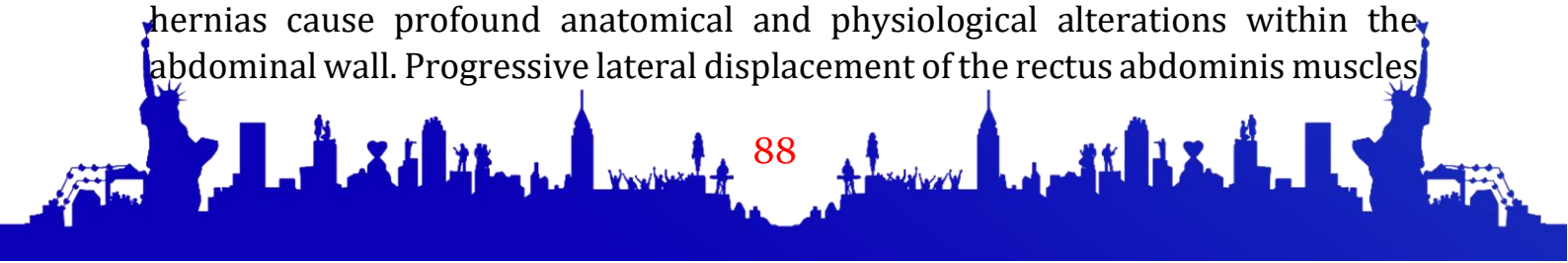
Introduction. Giant abdominal wall hernias remain one of the most difficult problems in modern abdominal surgery. They are usually defined as ventral or incisional hernias with fascial defects larger than 10 cm or those associated with a significant "loss of domain," where more than 20–30% of the abdominal viscera permanently reside within the hernia sac.

The incidence of giant ventral hernias has increased during recent decades because of the growing number of laparotomies, obesity, diabetes mellitus, postoperative wound infections, aging of the population, and repeated abdominal operations.

Patients suffering from giant hernias experience severe physical disability, chronic pain, cosmetic deformity, impaired respiratory mechanics, digestive dysfunction, and psychological distress. Surgical repair is technically demanding and is associated with considerable risks, including abdominal compartment syndrome, respiratory insufficiency, wound complications, and recurrence.

The introduction of component separation techniques has revolutionized abdominal wall reconstruction by allowing restoration of the abdominal midline while minimizing tissue tension. Today, these procedures are considered one of the cornerstones of complex abdominal wall reconstruction.

Anatomical and Physiological Changes in Giant Hernias. Long-standing giant hernias cause profound anatomical and physiological alterations within the abdominal wall. Progressive lateral displacement of the rectus abdominis muscles





leads to permanent shortening of the lateral abdominal muscles and significant widening of the linea alba defect. Muscle fibers undergo atrophy, fibrosis, and fatty degeneration, reducing their contractile function.

The abdominal cavity gradually adapts to a reduced visceral volume, whereas the hernia sac accommodates a substantial proportion of abdominal organs. This condition is referred to as loss of domain.

Loss of domain creates serious challenges during reconstruction because reduction of the herniated viscera into the abdominal cavity may abruptly increase intra-abdominal pressure, resulting in:

- abdominal compartment syndrome;
- respiratory insufficiency;
- reduced venous return;
- renal dysfunction;
- intestinal ischemia;
- postoperative mechanical ventilation.

Furthermore, repeated inflammation and previous surgical procedures frequently lead to dense adhesions involving the bowel, omentum, and abdominal wall, increasing the complexity and operative risk.

Principles of Component Separation

Component separation is based on the concept of mobilizing individual muscular layers of the abdominal wall to achieve tension-free closure of large fascial defects.

Instead of relying solely on prosthetic bridging, the technique restores the native abdominal wall anatomy by advancing musculofascial components toward the midline.

This approach preserves physiological abdominal wall function and improves long-term mechanical stability.

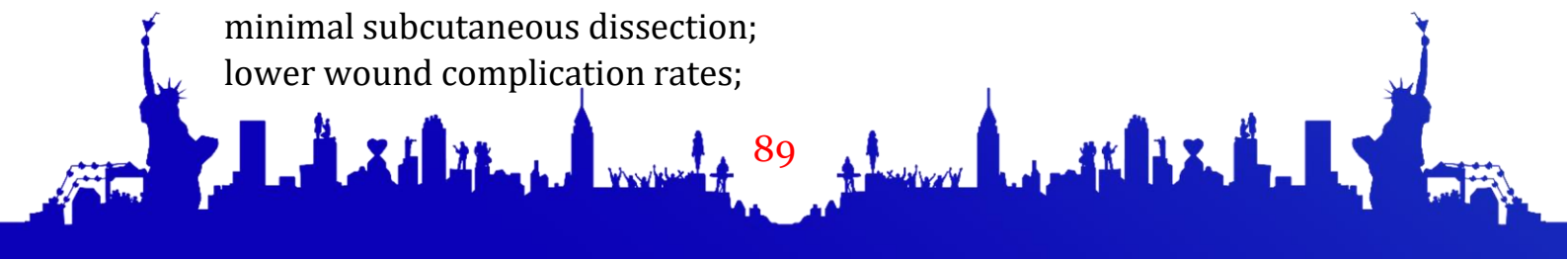
Posterior component separation with Transversus Abdominis Release (TAR), introduced by Novitsky and colleagues in 2012, has become one of the most significant advances in abdominal wall reconstruction.

Following retrorectus dissection, the posterior rectus sheath is opened medially, allowing division of the transversus abdominis muscle.

This creates a large, well-vascularized retromuscular plane extending laterally to the psoas muscles and cranially to the diaphragm.

Advantages of TAR include:

- wide retromuscular mesh placement;
- excellent prosthetic coverage;
- preservation of skin vascularity;
- minimal subcutaneous dissection;
- lower wound complication rates;





- restoration of abdominal wall biomechanics;
- ability to reconstruct defects exceeding 20 cm.

Numerous studies have demonstrated lower recurrence rates after TAR compared with traditional anterior component separation.

Prosthetic Reinforcement. Component separation alone is rarely sufficient for giant hernias. Current international guidelines recommend combining component separation with prosthetic mesh reinforcement.

The retromuscular (sublay) position is considered the gold standard because it provides:

- optimal biomechanical support;
- uniform force distribution;
- excellent mesh integration;
- reduced infection rates;
- lower recurrence.

Lightweight polypropylene meshes are commonly used in clean surgical fields, whereas biologic or biosynthetic meshes may be considered in contaminated environments.

The combination of TAR and retromuscular mesh placement currently represents one of the most effective reconstructive strategies for complex abdominal wall defects.

Recurrence rates after modern TAR procedures generally range between 3% and 10%, significantly lower than historical results of bridged mesh repairs.

The incidence of surgical site infection is also reduced owing to limited soft tissue dissection.

Enhanced Recovery After Surgery (ERAS) protocols further improve postoperative recovery by reducing pulmonary complications and shortening hospitalization.

Limitations and Complications. Despite its advantages, component separation remains technically demanding.

Potential complications include:

- seroma formation;
- hematoma;
- wound infection;
- mesh infection;
- abdominal compartment syndrome;
- chronic postoperative pain;
- recurrence.

Three-dimensional preoperative planning, patient-specific mesh design, artificial intelligence-based surgical planning, and enhanced biomaterials may further improve outcomes in the future.





Ongoing multicenter randomized trials are expected to establish standardized treatment algorithms for giant abdominal wall reconstruction.

Conclusion. Component separation has fundamentally transformed the management of giant abdominal wall hernias.

By restoring normal abdominal wall anatomy and enabling tension-free fascial closure, these techniques have substantially improved functional recovery and reduced recurrence rates.

Posterior component separation with transversus abdominis release combined with retromuscular mesh reinforcement currently represents the preferred reconstructive strategy for most giant ventral hernias.

Successful treatment requires careful patient selection, meticulous surgical technique, multidisciplinary perioperative management, and adherence to contemporary evidence-based guidelines.

Further prospective multicenter studies with long-term follow-up are necessary to optimize surgical strategies and improve patient outcomes.

