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Case report

Complex ventral hernia repair with a human acellular dermal matrix and component separation: A case series

Alvaro Garcia*, Anthony Baldoni

General Surgery and Abdominal Wall Reconstruction Center of South Florida, 17900 NW 5th St., Suite 201, Pembroke Pines, FL 33029, USA

HIGHLIGHTS

- Intraperitoneal placement of acellular dermal matrix using component separation.
- Acceptable recurrence rates of 16% at 2 years of follow up.
- Correlation in age and complication chances.
- Retrorectus technique possibly the best surgical technique for hernia repair.

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ABSTRACT

We present a case series of 19 patients requiring complex abdominal hernia repairs. Patients presented with challenging clinical histories with 95% having multiple significant comorbidities including overweight or obesity (84%), hypertension (53%), diabetes (42%), cancer (26%), and pulmonary disease (16%). The majority of patients (68%) had prior abdominal infections and 53% had at least one failed prior hernia repair. Upon examination, fascial defects averaged 282 cm^2. Anterior and posterior component separation was performed with placement of a human acellular dermal mesh. Midline abdominal closure under minimal tension was achieved primarily in all cases. Post-operative complications included 2 adverse events (11%) – one pulmonary embolism and one post-operative hemorrhage requiring transfusion; 6 wound-related complications (32%), 1 seroma (5%) and 1 patient with post-operative ileus (5%). Operative intervention was not required in any of the cases and most patients made an uneventful recovery. Increased patient age and longer OR time were independently predictive of early post-operative complications. At a median 2-year follow-up, three patients had a documented hernia recurrence (16%) and one patient was deceased due to unrelated causes.

Conclusion: Patients at high risk for post-operative events due to comorbidities, prior abdominal infection and failed mesh repairs do well following component separation reinforced with a human bioprosthetic mesh. Anticipated post-operative complications were managed conservatively and at a median 2-year follow-up, a low rate of hernia recurrence was observed with this approach.

1. Background

Patients with complex hernias present surgeons with significant technical challenges. Over the past decade, a better understanding of abdominal wall anatomy, physiology and pathophysiology of hernia formation has resulted in the development of new surgical approaches focused on restoration of the midline and abdominal wall functionality, protection of intra-abdominal viscera, and the prevention of hernia or bulge formation post-operatively [1].

First introduced 25 years ago by Ramirez [2], over the past decade the technique of component separation has come to the forefront with clinicians presenting the approach as a means to achieve primary abdominal closure under minimal abdominal tension in difficult cases. The addition of mesh to reinforce the repair has been shown to decrease hernia recurrence rates [3–5].

In recent years, a number of new prosthetic materials and surgical techniques have been introduced to address challenging hernias and most publications report series with variable

* Corresponding author.
E-mail addresses: alvarogarciamd@gmail.com (A. Garcia), baldoni.anthony@gmail.com (A. Baldoni).
URL: http://www.alvarogarciamd.com

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approaches and mesh materials.

Early literature suggests that the placement of synthetic mesh runs a high risk of infection requiring subsequent removal and/or hernia recurrence [6,7]. Biologic mesh, suggested as an alternative for use in infected fields, has been associated with a high rate of long-term laxity and recurrence [8–16].

With no randomized prospective trials reported, the heterogeneous nature of existing studies, specifically differences in patient characteristics, mesh selection and surgical approach, appears to contribute significantly to the wide range of post-operative outcomes [17]. Surgeons are left struggling to draw conclusions related to optimal surgical technique and mesh selection.

Over the past several years, the authors have selected open component separation reinforced with a human acellular dermal mesh (Flex HD Musculoskeletal Transplant Foundation, Edison, NJ) to treat patients with complex abdominal wall defects. To assess the validity of our preferred approach, we prospectively studied a cohort of high-risk patients from our practice, treated in the same facility by a single surgeon.

2. Methods

This is a prospective review of 19 consecutive high-risk patients, 8 males and 11 females, with large hernias repaired between July 2011 and July 2013. Prior to surgery, a detailed clinical assessment including a CT scan and cardiopulmonary evaluation was performed.

2.1. Surgical technique

Abdominal wall reconstruction was performed, decreasing tension across the midline using anterior and posterior component separation, and achieving primary closure in all cases. Depending on patient anatomy and risk profile, a selective periumbilical perforator sparing technique was used, particularly when the likelihood of skin necrosis was high.

Bilateral anterior component separation (Fig. 1) with intraperitoneal placement of a non-crosslinked human acellular dermal biologic mesh (*FlexHD, Musculoskeletal Transplant Foundation, Edison, NJ*) and midline closure was performed in the first 15 cases. The mesh, placed as an intraperitoneal underlay was prepared by delineating the four quadrants prior to implantation (Fig. 2). Using 1.0 PDS suture (*Ethicon, Somerville, NJ*), the mesh was secured to the anterior abdominal wall with interrupted vertical mattress stitches placed circumferentially to provide support and prevent small bowel entrapment (Fig. 3).

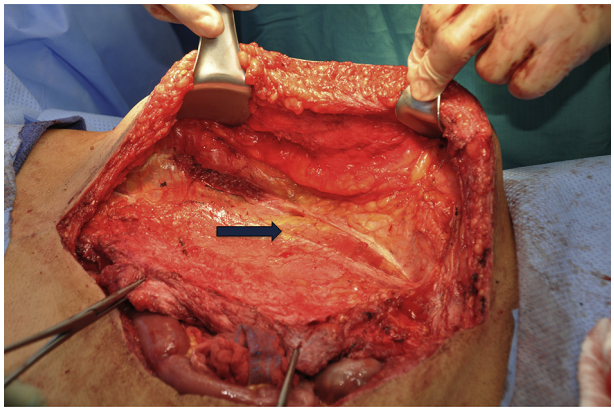

Fig. 1. Anterior component separation technique: the aponeurosis of the external oblique muscle is incised to 1–2 cm lateral to the lateral border of the rectus abdominus muscle as indicated by the arrow. The anterior component separation is performed bilaterally to decrease abdominal wall tension during subsequent midline closure.

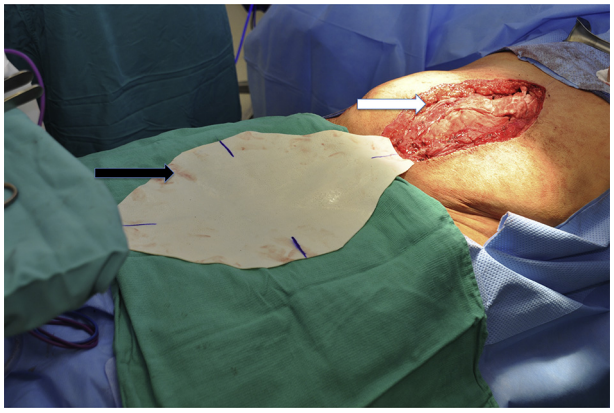

Fig. 2. Preparation of the mesh: to ensure proper size and placement, the mesh is measured and each of the quadrants marked prior to its introduction into the abdominal cavity (white arrow). In this figure we show the new diamond shape mesh (FlexHD® Diamond™).

In the more recent 4 cases, posterior component separation (Fig. 4), involving release of the posterior sheet of the rectus muscle and preserving the abdominal wall innervation and epigastric circulation, was performed as described by Pauli and Rosen [18]. In these cases, the biologic mesh was placed within the retrorectus space with overlap of at least 10 cm on each side of the midline and fixed in position with transfascial sutures (Fig. 5).

Following evaluation of mesh placement, midline approximation and debridement of the midline fascia was performed to obtain a well vascularized linea-alba. The midline was closed with running double loop 1.0 PDS suture. When posterior component separation was performed, the posterior fascia was closed using interrupted figure 8 1.0 vicryl sutures (*Ethicon, Somerville, NJ*) and the anterior fascia closed as described above.

During the course of this series, a newly shaped mesh, FlexHD® Diamond™ was introduced. This shape was used in last 7 cases of our series. With a larger surface area due to its rhomboid shape, the surgeons found that it offered enhanced abdominal wall coverage and reduced operative time as no intraoperative shaping was required prior to use.

To minimize the risk of seroma and bleeding, meticulous hemostasis was performed and Evicel® fibrin sealant (*Ethicon, Somerville, NJ*) and five grams of Arista®AH, a sterile, absorbable

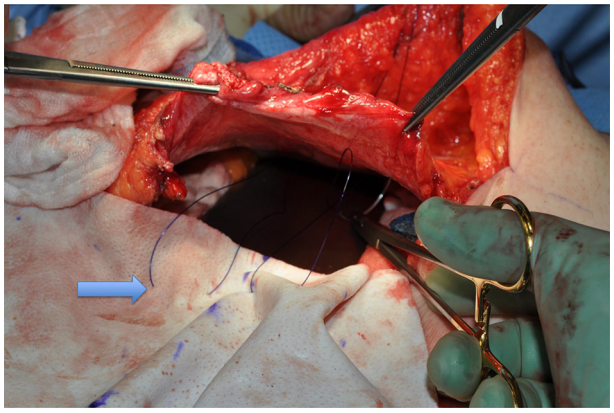

Fig. 3. Intraperitoneal placement of human acellular dermal matrix: this figure shows the U-stitch that is placed through the abdominal wall to the mesh and back to the abdominal wall (see arrow).