XCM BIOLOGIC® Tissue Matrix for Recurrent Hernia Repairs

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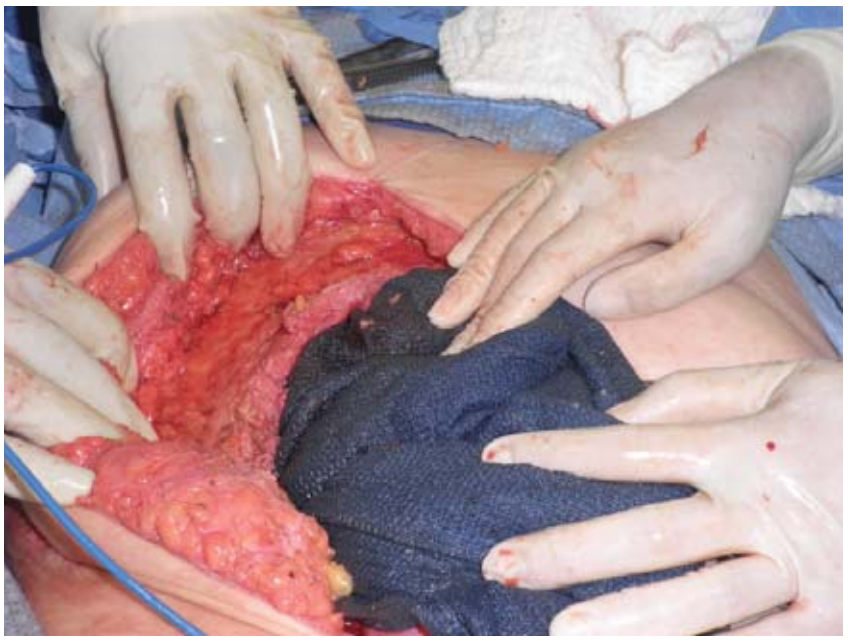

Figure 1. Creation of elevated flaps to expose the fascia.

Image courtesy of Juvonda Hodge, MD.

Introduction

Although ventral hernia is a frequent complication of abdominal surgery, there are many surgical approaches for reconstructing the abdominal wall. Compared with suture repairs, mesh repairs have been shown to be more effective with regard to recurrence,[1,2] and the use of mesh is standard in all but the smallest defects.[3] Surgeons can select from a number of available synthetic meshes and biologic grafts, although mesh selection is influenced by patient- and wound-related factors. Synthetic mesh has been associated with complications, particularly in complex repairs,[2,4] ranging from short-term morbidity to high recurrence rates—a worrisome prospect for surgeons and patients alike. High complication rates with synthetic mesh have led to the development of biologic grafts, which provide an extracellular matrix (ECM) scaffolding that is necessary for tissue repair.[2,5]

A prerequisite for good clinical outcomes in mesh repairs is constructive tissue remodeling, which is more likely to occur with the use of a biologic material.[6] Tissue remodeling is clinically characterized by revascularization and incorporation of the mesh into native tissue, thus offering good prospects for durable, effective outcomes. XCM BIOLOGIC Tissue Matrix, a sterile, non-crosslinked 3-dimensional ECM derived from porcine dermis, offers strength and properties to facilitate soft tissue healing with good host acceptance and is available in a range of sizes (2×4 cm to 20×30 cm).[7,8] XCM BIOLOGIC Tissue Matrix undergoes a proprietary manufacturing process that removes cells and DNA, and minimizes damage to native tissue architecture.[7]

Planning for Successful Repair

Durable repair of ventral hernia requires the surgeon's attention to a myriad of details perioperatively, according to Juvonda Hodge, MD, assistant professor of surgery at the University of South Alabama in Mobile, Alabama. Patients referred to Dr. Hodge often have recurrent hernias that are associated with substantial scarring. In some cases, she has to remove previously implanted mesh before conducting the repair. Dr. Hodge attempts to determine the reasons for recurrence to guide her selection of surgical approach and materials. "One of the most difficult things in dealing with recurrent hernia is first to figure out why the patient recurred," she said. A review of the operative report may provide clues as to why the repair failed; possible explanations can include suturing technique or insufficient overlap at the attachment.[3] "The key thing is preoperative preparation—getting all the information that you can about the patient, whether it's computed tomography scans, the old operative report, the patient's comorbidities, and whether you can get those in better control," Dr. Hodge said.

Visceral bowel adhesions are a predictable complication with mesh repairs. Biologic meshes, due to their origin, lack the materials known to stick to the bowel like polypropylene.[4,9,10] Morbidity from mesh-related infection can be serious (eg, enterocutaneous fistulas, reoperation),[11] and infection is a risk factor for hernia recurrence.[3]

Working With a Biologic Mesh Implant

Surgeons repairing midline defects face the dual task of repairing the abdominal wall and achieving cutaneous coverage.[12] Dr. Hodge visualizes a 3-part procedure: getting into the abdomen and locating different hernia pockets, taking down adhesions, and placing the mesh. Intraoperative vigilance is required, taking care to avoid any break in technique and irrigating and closely inspecting the field so as not to overlook any inadvertent bowel injury.

Dr. Hodge generally places mesh as an underlay, ideally with reapproximation of the rectus in the midline and using components separation as needed, achieving moderate tension. Care is taken to debride tissue where necessary and to irrigate the abdomen. She places 2 or 3 drains to minimize development of seroma. "Anytime you develop flaps or separate components, patients are going to develop seromas, so that's probably one of the most important steps when using a biologic," said Dr. Hodge. She closes subcutaneous tissue with 0-polypropylene mesh sutures in an interrupted fashion and closes skin with a staple.

Biologic grafts can be classified by source material (human- or animal-derived), differential processing techniques, and handling characteristics.[2,6] Among animal-derived grafts, strength is a major concern to surgeons because of the potential effect on the durability of the ventral hernia repair as well as functional outcome. XCM BIOLOGIC Tissue Matrix was evaluated in preclinical studies that demonstrated effectiveness throughout the healing process, during which it sustained tensile strengths in the surgical site that were greater than those of native tissue and demonstrated good suture pullout strength.[7,8,13]

Manufacturing processes also have been shown to affect outcomes in preclinical studies. In a primate study that evaluated functional outcomes and host responses to mesh implants that underwent various decellularization methods, some processed meshes led to modified collagen matrices and were associated with scarring, inflammatory responses, graft pleating, and poor resorption.[14] Preclinical evaluations performed in animals of XCM BIOLOGIC Tissue Matrix demonstrated that it exhibits cellular infiltration, minimal inflammatory response, and low surgical site morbidity.[13] Many cytokines and growth factors that are present in native tissue are retained in XCM BIOLOGIC Tissue Matrix after decellularization.[15]

In Dr. Hodge's experience, XCM BIOLOGIC Tissue Matrix is easy to use and effective, even in complex repairs. "It incorporates very well; that's one of the good things about it," she said. "It has some stretch but not so much that you worry about your repair failing, as was the case with some of the earlier biologics." Dr. Hodge also appreciates that XCM BIOLOGIC Tissue Matrix is easy to suture, prehydrated, and "is ready to go from the package," thus eliminating preparation time and risk for contamination during soaking.

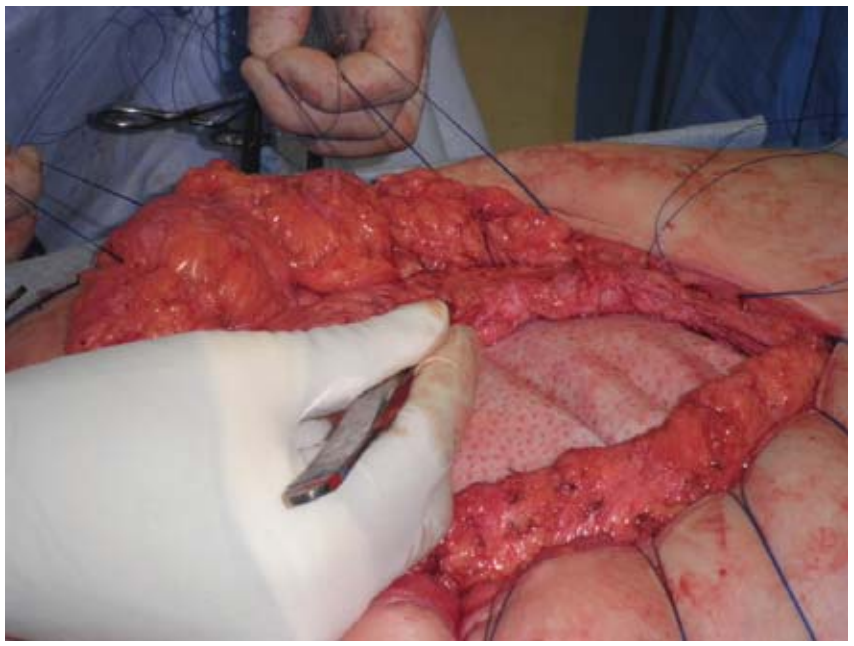

Figure 2. Underlay technique to secure XCM BIOLOGIC.

Image courtesy of Juvonda Hodge, MD.

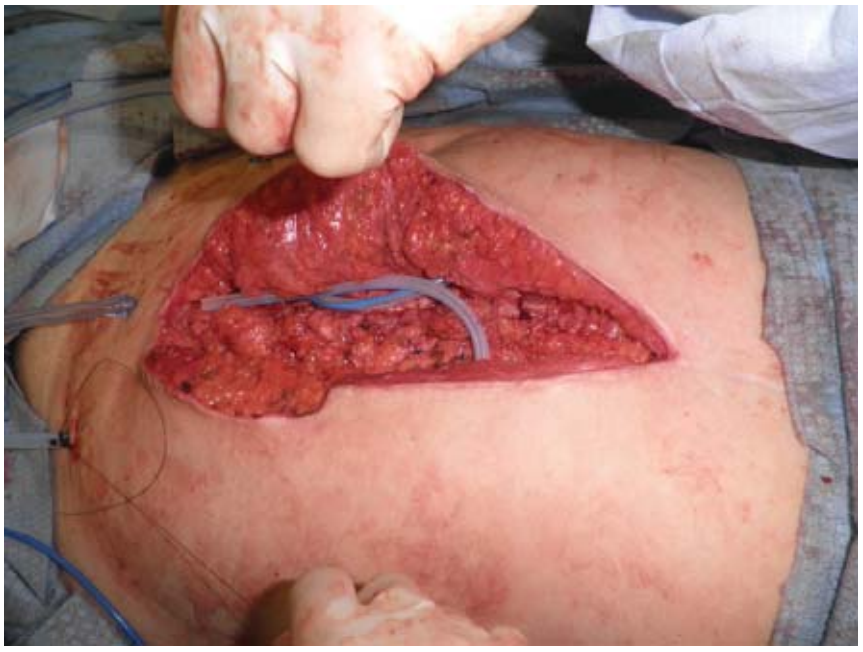

Figure 3. Fascia closure overlying XCM BIOLOGIC following repair.

Image courtesy of Juvonda Hodge, MD.

Case Presentation[a]

A 50-year-old obese man with 3 prior laparotomies was referred for recurrent ventral hernia repair, secondary to an emergent colostomy for perforated diverticulitis. Initial hernia developed after stoma takedown and had been repaired with fascia put to the midline with a synthetic mesh prosthetic; a second hernia developed approximately 9 months later. The patient worked at a sedentary desk job. Although loss of abdominal domain was noted, comorbidities were not remarkable and included anxiety.

The patient was taken into surgery and the abdominal wall was entered. Peak airway pressures were monitored at the outset to ensure they were not more than 10 mm Hg. Broad-spectrum antibiotics were administered preoperatively. No infection of the synthetic prosthetic mesh was observed intraoperatively; however, the patient was found to have extensive and very dense adhesions of the bowel to the prosthetic mesh, necessitating a small bowel resection, anastomosis, and repair of midline hernia and repair of hernia at the stomal site. Elevated flaps were created to expose fascia (Figure 1); overlying fat was removed from the fascia to facilitate reapproximation of the fascia to the midline. The abdomen was irrigated and as much pooled blood as possible was removed. Abdomen was inspected to minimize risk from unrecognized enterotomy. XCM BIOLOGIC Tissue Matrix mesh was placed in underlay position (Figure 2), and native tissue reapproximated with 5 cm of overlap on either side of the defect (Figure 3). Suturing with 0-polypropylene mesh was done in interrupted fashion; subcutaneous drains were placed. Because of concerns about patient's weight and loss of domain, peak airway pressures again were checked and found to be less than 10 mm Hg. A nasogastric tube was placed to monitor gastrointestinal function, and an abdominal binder was applied.

The immediate perioperative period was uneventful. The patient was hospitalized for several days and received a standard regimen of enoxaparin for prophylaxis of deep vein thrombosis; early ambulation was demonstrated and no thrombosis was detected. Postoperative edema was not significant; spirometer-measured pulmonary function was good. After bowel function returned, the patient was discharged home with drains intact. He was seen postoperatively several times. The patient inadvertently dislodged one drain, but no attendant complications were observed. A small seroma developed subsequently in the mid-portion of the wound and was drained successfully without sequelae. The patient was placed back in the abdominal binder and the seroma did not recur with any significance. The remaining drain, binder, and staples were removed at the next visit.

Conclusion

The patient's recovery was good and he was able to return to work approximately 3 weeks postoperatively. XCM BIOLOGIC Tissue Matrix was selected for this complex abdominal reconstruction on the basis of evidence and experience supporting its demonstrated balance of strength and integration. The manufacturing process allows retention of cytokines, growth factors, and ECM components with minimal damage to tissue architecture. Preclinical studies demonstrate that XCM BIOLOGIC Tissue Matrix facilitates tissue repair throughout the postoperative period, sustained strength greater than native tissue, and minimal inflammatory response.

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[a] Results from case studies are not predictive of results in other cases. Results in other cases may vary.