



Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Allograft AlloDerm[®] tissue for laparoscopic transabdominal preperitoneal groin hernia repair: A case report



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ARTICLE INFO

Article history:

Received 9 October 2013

Received in revised form 23 January 2014

Accepted 21 February 2014

Available online 26 March 2014

Keywords:

AlloDerm

Inguinal hernia

Femoral hernia

Recurrent hernia

Laparoscopic hernia repair

ABSTRACT

INTRODUCTION: Synthetic mesh is the prosthetic material used for most inguinal hernioplasties. However, when left in contact with intra-abdominal viscera, it often becomes associated with infection and migration, particularly in irradiated tissues, contaminated fields, immunosuppressed individuals, and patients with intestinal obstruction or fistula. AlloDerm[®] Regenerative Tissue Matrix (LifeCell Corporation, Branchburg, NJ) is derived from human cadaver skin and may be associated with fewer visceral adhesions and more durability in infected fields than synthetic mesh.

PRESENTATION OF CASE: We report the first case in which AlloDerm was used in a laparoscopic transabdominal preperitoneal repair of a multiple recurrent right inguinal hernia, a left femoral hernia, and an umbilical hernia in the same patient. Use of AlloDerm greatly enhanced the maneuverability during laparoscopic hernia repair due to its pliability and strength and eliminated the need to cover the prosthetic with peritoneum.

DISCUSSION: Previous pelvic radiation and multiple previous groin repairs can render the peritoneum friable, resulting in obstacles to successful closure. AlloDerm is a reasonable choice for groin hernia repairs when such factors are present.

CONCLUSION: The long-term durability of AlloDerm for laparoscopic groin hernia repairs is yet to be determined, but based on current data it seems prudent to use this technique in laparoscopic repair of complex groin hernias where infection is suspected or inadequate prosthetic coverage with peritoneum is anticipated.

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1. Introduction

Polypropylene mesh has a significant complication rate in reconstructing trunk defects when it is placed directly over viscera or if the operative site has been irradiated or contaminated with bacteria.^{1–5} An alternative is the use of a biologic tissue matrix derived from human cadaver skin (acellular human dermis), porcine cross-linked dermal collagen, or porcine small intestinal submucosa. When placed in the body, acellular human dermis eventually revascularizes and remodels to human tissue.⁶

AlloDerm[®] Regenerative Tissue Matrix (LifeCell Corporation, Branchburg, NJ) is a commercially available acellular human cadaveric dermis with its native basement membrane components intact. It has various biochemical and structural components of the dermal extracellular scaffold that enables it to gradually recellularize and

revascularize with autologous tissue after implantation. AlloDerm integrates with native fascial tissues and becomes repopulated with fibroblast cells.^{6–8} AlloDerm has less adhesion formation and does not heal by inflammation; rather, healing is by stem cell migration. It also has diminished incidence of infection, erosion, adhesion formation, and rejection compared with synthetic mesh.^{9–12}

One of the important properties of AlloDerm is its tendency to stretch significantly (up to 50%) even prior to implantation. Due to its pliable nature, it is very easy to handle laparoscopically. It also has stronger breaking strength at the fascial implant interface when compared with some synthetic mesh products.¹³

Biologic tissue matrices are especially useful in fields that are suspected to have bacterial infection, that have been previously radiated, or in which abdominal contents cannot be isolated.^{1,14,15} Here, we present a case report of a complicated laparoscopic recurrent inguinal hernia repair where heightened suspicion of chronic underlying infection warranted the use of a biologic tissue matrix.⁹ To the best of our knowledge, the use of AlloDerm has not been

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previously described in laparoscopic repair of inguinal-femoral hernias.

2. Presentation of case

An 80-year-old white female presented with an umbilical hernia (2 cm, reducible mass) and a recurrent symptomatic right inguinal hernia (3 cm, painful, reducible mass). Significant past history included a right inguinal hernia repair over 30 years ago, thought to be a tissue repair. She suffered a recurrence in 1995, which was repaired with mesh, and another recurrence 2 years later, which became incarcerated and was also repaired using mesh. All were open conventional repairs. She had undergone radiation therapy to the pelvic region in 1989 for vulvar cancer and had a history of rheumatoid arthritis under treatment with steroids. With this history of multiple open repairs on the right inguinal hernia, the decision was made to repair the hernia laparoscopically. During the operation, a moderate amount of bowel adhesions in the pelvis were encountered. Given the history of radiation, adhesions were taken down very carefully, and the site of hernia recurrence was identified. The peritoneum was very thin and friable on the right and was easily fragmented during the dissection (Fig. 1). In addition, there was milky fluid which looked suspicious for an infection. Although the intraoperative gram stains were negative, we were concerned about possible occult infection of the previous material that was still in place. For these collective reasons, we decided to use a biologic tissue matrix instead of synthetic polypropylene or dual-sided polypropylene/polytetrafluoroethylene (PTFE) mesh. Because the gram stain was negative, we elected to continue with the repair. Two small pieces of AlloDerm were prepared and sutured together with running polydioxanone sutures, creating an 8 cm × 8 cm piece. The matrix was then tacked to the abdominal wall in several places superiorly and slightly laterally (using caution to stay medial to the nerves), and Cooper’s ligament inferior-medially with 1-cm overlap inferiorly to completely cover the myopectineal orifice (Fig. 2). Laparoscopic examination of the left myopectineal orifice identified an incidental femoral hernia (Fig. 3). We decided to use a 10 cm × 4 cm piece of AlloDerm for the repair of the left side with final coverage with peritoneum (Fig. 4). The patient’s immediate postoperative recovery was unremarkable. The floor of the inguinal regions on subsequent follow-up examinations was felt to be strong. However, the patient developed a femoral hernia on the right side after 3 months. This was a small, asymptomatic reducible hernia that was repaired under local anesthesia with a large Bard PerFix® plug (Davol Inc., Warwick, RI, USA). There have been no further complications in 2 years of follow-up since the last repair in this patient.

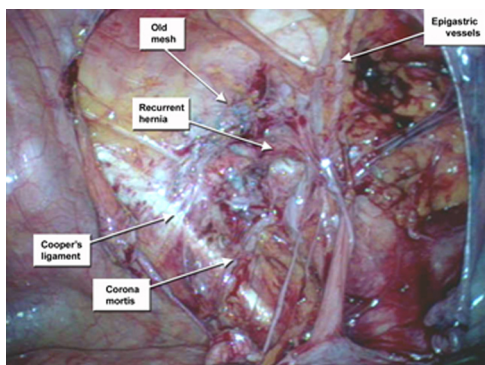


Fig. 1. Intraoperative photograph showing the peritoneum during dissection.

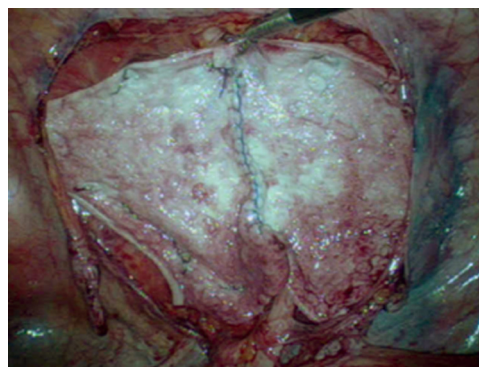


Fig. 2. Intraoperative photograph showing placement of the matrix within the abdominal cavity.

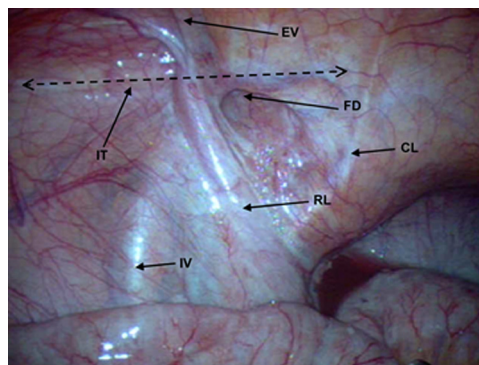


Fig. 3. Intraoperative photograph showing identification of an incidental femoral hernia upon laparoscopic examination of the left myopectineal orifice. Femoral defect (FD) is shown on the left side. The round ligament (RL), iliac vessels (IV), Cooper’s ligament (CL), iliopectineal tract (IT), and epigastric vessels (EV) are shown.



Fig. 4. Intraoperative photograph showing use of a 10 cm × 4 cm matrix piece for the repair of the inguinal hernia on the patient’s left side.

3. Discussion

AlloDerm has been used in repair of large abdominal wall hernias, including laparoscopic ventral hernia and laparoscopic diaphragmatic hernia repairs.¹⁶ Diaphragmatic hernia repairs have been abandoned consequent to unsatisfactory results associated with bulging at the site of bridged repairs due to overstretching during respiration (Merphy P, Children’s Mercy Hospital, Kansas City, KS, USA, personal communication, 2005). AlloDerm has also been used for reconstruction of complex pelvic and abdominal wall defects. It has been placed in direct contact with the viscera and has been used in cases where the operative field was irradiated and/or contaminated with bacteria.¹⁴

In our patient, due to previous operations on the right side and significant radiation changes, we were left with a very thin and friable peritoneum. This limited our ability to cover the prosthesis with peritoneum. Options included omental coverage of a synthetic mesh or dual-sided mesh with an expanded PTFE side facing the abdominal cavity. One of the reasons we elected to choose a biologic tissue matrix was because of concern of occult infection, as creamy, white secretions were seen during the preperitoneal dissection.^{17,18} We continued with the repair because intraoperative gram stains were negative. Final intraoperative cultures were negative, suggesting that the secretion was most likely due to the previous effects of radiation, but a chronic infectious process could not be ruled out at the time of surgery. As a result, it was felt that the safest approach was use of the most infection-resistant prosthesis.

Surgisis® (Cook Biotech Inc., West Lafayette, IN, USA) has been used previously in laparoscopic inguinal hernia repairs with success.^{19,20} Our choice of AlloDerm in this case was based on the premise that AlloDerm would hold sutures and tacks better, and as a result of its elasticity, render coverage of the entire myopectineal orifice easier. The selection of AlloDerm might also reduce the risk of recurrent bowel adhesions, which had been present in the setting of previously placed synthetic mesh and added to the complexity of this patient's surgical management. In addition, AlloDerm can be conveniently rolled up and introduced via laparoscopic ports. Fixation of AlloDerm was done with tacks as opposed to transfascial fixation. Careful minimal placement of these tacks can reduce the incidence of nerve injury and subsequent postoperative pain. Our patient had inadequate coverage of the femoral space inferiorly, where the two edges of the matrix were sutured together. This could have been the reason for the occurrence of her right femoral hernia at postoperative month 3. This hernia may have been avoided if the matrix was oriented in such a way that no gaps existed on the inferior aspect and where the two meshes were sutured to each other (Fig. 3). Alternatively, the matrix could have been extended several centimeters below Cooper's ligament, sufficiently covering the femoral canal as was done with the left femoral hernia. For this reason, a larger piece of AlloDerm could have been used, but such a piece was not available at the time of the operation.

The femoral hernia on the left was discovered incidentally and it was not symptomatic. Although peritoneal coverage of the prosthesis would have been technically possible on the left side, we elected to use AlloDerm for the repair of the left femoral hernia due to the patient's history of radiation and possible contamination from suspected chronic infection on the right side. No reports of left femoral hernia were noted after the operation.

4. Conclusion

AlloDerm has an exceptional safety and tolerability profile, especially where bowel adherence or intraabdominal contamination are suspected.^{12,17,18} Previous pelvic radiation and multiple previous groin repairs can render the peritoneum friable, resulting in obstacles to successful closure. Biologic tissue matrices seem to be a reasonable choice for groin hernia repairs when such factors are present. The long-term durability of AlloDerm for laparoscopic groin hernia repairs is yet to be determined, but based on current data it appears rational to use this technique in laparoscopic repair of complex groin hernias where infection is suspected or inadequate prosthetic coverage with peritoneum is anticipated. An early report of a randomized comparative clinical trial of Strattice™ Reconstructive Tissue Matrix (LifeCell Corp., Branchburg, NJ, USA) and lightweight synthetic mesh in the repair of open inguinal hernias shows promising results.²¹ Whether the pliability of Strattice

and its increased stiffness compared with AlloDerm will make it more difficult to place laparoscopically and fixate in the inguinal region remains to be answered. Results from animal studies and clinical experience should be explored to determine long-term outcomes.

Conflict of interest

Drs. Amirlak, Gerdes, and Puri declare no conflicts of interest. Dr. Fitzgibbons has received grant support from LifeCell Corp., Branchburg, NJ, USA.

Funding

LifeCell Corp. funding was limited to supporting the manuscript editing provided by Peloton Advantage, LLC.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

Amirlak was responsible for data collection and data analysis. Gerdes, Puri, and Fitzgibbons contributed toward analysis and interpretation of data. Both Amirlak and Fitzgibbons acted as surgeon and senior surgeon, respectively, for surgical operation. All the authors were involved in writing and approving the final draft of the manuscript.

Acknowledgments

Manuscript editing was done by Peloton Advantage, LLC, Parsippany, NJ, USA and funded by LifeCell Corp., Branchburg, NJ, USA.

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